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10 APRIL 1970

MISSION CONTROL CENTER PROGRESS REPORT

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CONTRACT NAS 9-1261

1 JANUARY THRU 31 MARCH 1970

PREPARED FOR

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

MANNED SPACECRAFT CENTER

PHILCO 

Philco-Ford Corporation
Electronics Group
Houston Operation
1002 Gemini Avenue
Houston, Texas 77058



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MANNED SPACECRAFT CENTER
Houston, Texas

Approved by: *C. W. Abbitt*
C. W. Abbitt
MCC Program Manager

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FOREWORD

The Quarterly Progress Report of the Mission Control Center (MCC) Program is submitted in accordance with Article X, Paragraph (a) of Schedule III, Modification No. 67 to Contract NAS 9-1261, as extended by Schedule III First Option Modification No. 80.

This report has been prepared and submitted by Philco Houston Operations (PHO) for the period from 1 January through 31 March and covers the remaining Schedules I, II, and III effort, as well as the current Schedule III First Option effort under Modification No. 80 to Contract NAS 9-1261.

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SECTION 1

PROGRAM SUMMARY

1.1 ACCOMPLISHMENTS DURING JANUARY, FEBRUARY AND MARCH

- A. The scheduled H-2 simulation readiness date of 5 January was met, and simulations were started on 6 January. MCC display and communications configuration updates were accomplished at scheduled intervals throughout the quarter, and verified by applicable validation tests. ALSEP 1 support was reduced to 2 hours per day except during terminator crossings, during which periods 24-hour-per day support was supplied. Training on CCATS System Configuration Unit (SCU) maintenance and restoration of simulated equipment faults was stressed.

During the quarter simulation activity was heavy. Numerous intersystem faults were integrated into the simulations for overall training. Three major pad tests were conducted, and numerous validation tests were successfully completed.

All PHO personnel assigned to Mission H-2 positions requiring certification have been certified as qualified for mission support.

- B. The CCATS SCU continues to perform in an operational mode since it was turned over to FOSO on 31 December. On several occasions, when going from a power-down condition to power-up conditions, there have been faulty SCU test circuit indications prior to stabilization of operations for up to 3 or 4 hours after power-up. In all cases, operational configuration circuitry (cross-point connections) has performed in accordance with specifications. The abnormal fault detection circuitry problems will be researched after the Apollo 13 flight.

The digital television equipment (DTE) eight-channel cluster is nearing completion, with shipment scheduled for 2 May. Preparatory MCC work is nearing completion. Philco-Ford

management is exercising all possible measures to insure that the slippage of 69 days is not further extended by Hazeltine.

Requests for proposals for the color scan converter to convert spacecraft sequential field signals to the NTSC format were released during January. Evaluation of proposals was completed on 2 March. Negotiations are currently in progress.

During the quarter 46 EO's were received, six were cancelled and four were terminated. Forty-six were completed, leaving 298 EO's in the system (13 Schedule II, 140 Schedule III and 145 Schedule III, Option 1). Eighteen H-2 EO's were completed, leaving 11 H-2 EO's open at the end of the quarter. All will be completed by 9 April.

- C. All operational support tasks met scheduled milestones. A second source for developing D/TV slides by Gerber plotter services (Systematic Design) was qualified, lessening previously reported problems on this task. An operational version of the DRAFT program has been completed, and will be turned over to Display Format engineers during April.
- D. The PHO Safety Review Committee met on 6 March to measure the degree of readiness of all PHO elements to support the upcoming operations. The few unresolved items were identified and assigned for resolution. The final Flight Safety Board met on 1 April to insure overall readiness for mission support.
- E. The MCC readiness cycle and priority EO's required for the upcoming missions are listed in the attachment.

MISSION READINESS

AS- 508 H2

PARA. NO.	TASK	SCHEDULE	ACTUAL	COMMENTS
IA7-A	DISPLAY AND TM RECONFIGURATION	12/10/69	12/10/69	
IA7-B	COMMUNICATION RECONFIGURATION	N/A	N/A	
IA7-C	ASCATS RECONFIGURATION	12/17/69	12/9/69	
IA7-D	RECONFIGURATION TESTING	12/17/69	12/16/69	
IA7-F	MCC HARDWARE VALIDATION TEST MAN.	12/10/69	12/5/69	
IA7-G	PCM PROGRAM W/O DATA ROUTING	N/A	N/A	
IA7-H	M AND O OPERATING PROCEDURES	1/6/70	12/31/69	
IA7-I	PCM PROGRAM WITH DATA ROUTING	12/10/69	12/1/69	
IC2-F	TR 155 MASTERS	12/23/69	12/10/69	
IC4-A	MCC BASELINE HARDWARE CONFIGURATION	3/13/69	3/13/69	
IC4-D	PRIMARY LISTINGS	11/21/69	11/21/69	
IC4-E	SECONDARY LISTING	12/23/69	11/21/69	
IC4-F	TR 155	1/12/70	12/31/69	
IC4-G	CROSS CONNECT LISTS	11/21/69	11/21/69	
IC4-J	CONFIGURATION ORACT TEST LISTINGS	12/10/69	12/11/69	
IC4-K	CONFIG. ORACT TEST PACKAGE PROCED.	12/15/69	12/15/69	
ID1-B	QA SYSTEMS SURVEY REPORT	4/1/70	3/31/70	
I12-C	TM DATA FORMAT CONTROL BOOK	1/28/70	1/28/70	Rev. 4
	CMD DATA FORMAT CONTROL BOOK	1/9/70	1/9/70	Rev. 5
	TRK DATA FORMAT CONTROL BOOK	1/14/70	1/14/70	Rev. 5
I12-D	APCU PROGRAM SPECS	10/1/69	10/1/69	
	GSSC PROGRAM SPECS			
	SSB-400-GSSC GENERAL SPECS	2/16/70	2/17/70	Rev. B
	SSB-402-GSSC LM SPECS	2/10/70	2/16/70	Rev. A, Change 1
	SSB-401-GSSC SATURN SPECS	12/15/69	12/22/69	Rev. A, Change 1
	SSB-403-GSSC CSM SPECS	12/9/69	12/9/69	Rev. 1, Change 1
	SSB-404-GSSC DISPLAY SPECS	10/23/69	10/23/69	Change 3
I12-E	CCATS PROGRAM REQUIREMENTS	12/8/69	12/8/69	Change 3
I12-F	APCU PROGRAM	1/2/70	12/31/69	
I12-G	RSDP PROGRAM REQUIREMENTS -- TM	9/23/69	9/23/69	Rev. 1, Change 2
I12-G	RSDP PROGRAM REQUIREMENTS -- CMD	3/1/70	3/1/70	Rev. 1, Change 2
IIIB3-2	X-Y PLOTBOARD FORMATS	4/10/70		5 Complete
IIIB3-3	D/TV FORMATS	4/8/70		310 Complete

MISSION READINESS

AS- 508 H2

PARA. NO.	TASK	SCHEDULE	ACTUAL	COMMENTS
IIIB3-4	PROJECTION PLOTTER FORMATS	4/10/70		19 Complete
IIIB3-6	D/TV SLIDES	4/8/70		13,397 Complete
IIIB3-7	PROJECTION PLOTTER SLIDES	4/10/70		43, Complete
IIIB3-8	SHELLY DRK RETICLES	4/8/70		441 Complete
IIIB3-9	PROJECTION READOUT RETICLES	4/8/70		211 Complete
IIIB3-11	UPDATED MISSION APPENDICES	5/21/70		
IIIC-3	RTCC TRAJECTORY PROG. REQUIREMENTS	3/25/70	3/25/70	Change 96
	RTCC TM PROGRAM REQUIREMENTS	3/17/70	3/17/70	Change 93
	RTCC COMMAND PROG. REQUIREMENTS	8/29/69	8/29/69	Change 33
	ALSEP APPLICATIONS SOFTWARE REQ.	3/24/70	3/24/70	Change 11
	RTCC OPERATIONAL SUPPORT PLAN	3/18/70	3/20/70	
IIIE3-A	PSRD	1/28/70	1/28/70	Rev. 18
IIIE3-C	MISSION INSTRUMENTATION SUP. PLAN	1/6/70	1/6/70	

MISSION READINESS

AS-509 H3

PARA. NO.	TASK	SCHEDULE	ACTUAL	COMMENTS
IA7-A	DISPLAY AND TM RECONFIGURATION			
IA7-B	COMMUNICATION RECONFIGURATION	N/A	N/A	
IA7-C	ASCATS RECONFIGURATION			
IA7-D	RECONFIGURATION TESTING			
IA7-F	MCC HARDWARE VALIDATION TEST MAN.			
IA7-G	PCM PROGRAM W/O DATA ROUTING	N/A	N/A	
IA7-H	M AND O OPERATING PROCEDURES			
IA7-I	PCM PROGRAM WITH DATA ROUTING			
IC2-F	TR 155 MASTERS			
IC4-A	MCC BASELINE HARDWARE CONFIGURATION	6/27/69		
IC4-D	PRIMARY LISTINGS	4/24/70		
IC4-E	SECONDARY LISTING			
IC4-F	TR 155			
IC4-G	CROSS CONNECT LISTS	4/24/70		
IC4-J	CONFIGURATION ORACT TEST LISTINGS			
IC4-K	CONFIG. ORACT TEST PACKAGE PROCED.			
ID1-B	QA SYSTEMS SURVEY REPORT	9/21/70		
II2-C	TM DATA FORMAT CONTROL BOOK	2/4/70	2/4/70	Rev. 1
	CMD DATA FORMAT CONTROL BOOK	1/9/70	1/9/70	Rev. 5
	TRK DATA FORMAT CONTROL BOOK	1/14/70	1/14/70	Rev. 5
	APCU PROGRAM SPECS	5/7/70		
II2-D	GSSC PROGRAM SPECS			
	SSB-400-GSSC GENERAL SPECS	2/16/70	2/17/70	Rev. B
	SSB-402-GSSC LM SPECS			
	SSB-401-GSSC SATURN SPECS	12/15/69	12/22/69	Rev. A, Change 1
II2-E	SSB-403-GSSC CSM SPECS	12/9/69	12/9/69	Rev. 1, Change 1
	SSB-404-GSSC DISPLAY SPECS	4/21/70		
	CCATS PROGRAM REQUIREMENTS	2/1/70	2/1/70	
	APCU PROGRAM	7/1/70		
II2-F	RSDP PROGRAM REQUIREMENTS - TM	12/1/69	12/1/69	Rev. 1, Change 1
II2-G	RSDP PROGRAM REQUIREMENTS - CMD	12/1/69	12/1/69	Rev. 1, Change 1
IIIB3-2	X-Y PLOTBOARD FORMATS	9/29/70		0 Complete
IIIB3-3	D/TV FORMATS	9/25/70		291 Complete

MISSION READINESS
AS-509 H3

PARA. NO.	TASK	SCHEDULE	ACTUAL	COMMENTS
IIIB3-4	PROJECTION PLOTTER FORMATS	9/29/70		1 Complete
IIIB3-6	D/TV SLIDES	9/25/70		6,055 Complete
IIIB3-7	PROJECTION PLOTTER SLIDES	9/29/70		0 Complete
IIIB3-8	SHELLY DRK RETICLES	9/25/70		0 Complete
IIIB3-9	PROJECTION READOUT RETICLES	9/25/70		0 Complete
IIIB3-11	UPDATED MISSION APPENDICES	11/9/70		
IIIC-3	RTCC TRAJECTORY PROG. REQUIREMENTS	3/25/70	3/25/70	Change 96
	RTCC TM PROGRAM REQUIREMENTS	3/17/70	3/17/70	Change 93
	RTCC COMMAND PROG. REQUIREMENTS			
	ALSEP APPLICATIONS SOFTWARE REQ.			
	RTCC OPERATIONAL SUPPORT PLAN			
IIIE3-A	PSRD	4/21/70		
IIIE3-C	MISSION INSTRUMENTATION SUP. PLAN			

ENGINEERING ORDERS
AS- 508 H2

E.O. NO.	DESCRIPTION	I AND C	TEST
3122D	INSTALL NEW MODULE - CONSOLE 73A	9/12/69	9/22/69
3542D	INSTALL (2) D9/5B2 MODULES - CONSOLE 37	9/16/69	10/24/69
3548D	INSTALL D9/5B2 MODULE - CONSOLE 18	9/15/69	9/19/69
4029V	DIVIDE & MODIFY ROOM 210 TO 210A & 210B	3/5/70	
	RELOCATE LGE CONSOLE, PROVIDE 525L TV FROM BLDG 8 - AMEND 1	3/30/70	
4030V	PROVIDE INHIBIT FOR COMMERCIAL TV PAO	3/27/70	
4032V	PROVIDE TV POOL OUTPUT SIGNAL TO RIGHT HAND BOOTH OF VIEWING ROOM	3/27/70	
4033V	INSTALL COLOR CAMERA & ASSOCIATED EQUIPMENT		
4102D	REASSIGNMENT OF MOC/CIM ENCODERS	12/4/69	12/20/69
4103D	IMPLEMENT CS455 TO RTA 5 & 6	8/19/69	9/15/69
4108D	PROVIDE BCD TIME FROM MITE	12/15/69	12/19/69
4113T	PROVIDE COAX CABLE INTERFACE TO "C" CIM	12/12/69	1/6/70
4115T	MODIFY SDD FOR SCU INTERFACE	12/12/69	1/6/70
4116T	INTERFACE ALCIM RM 242 WITH CIM HIGH SPEED PRINTER RM 316	2/9/70	2/20/70
4204D	MODIFY & RELOCATE CONSOLE 79	12/22/69	12/30/69
	INTERCHANGE CONTROL PANEL CABLING - CONSOLE 79	12/22/69	12/30/69
4210T	SWITCH DATA THRU FM/FM & PCM SYSTEMS	1/5/70	1/22/70
4222D	RECONFIGURE CONSOLE 29	1/5/70	1/6/70
4226D	MOVE CONSOLE 47A & 49A IN RM 112 Laterally	12/6/69	12/30/69
4227D	INSTALL D9/2 STATUS MODULE - CSL 79 FOR CCATS TTY	12/30/69	12/30/69
4229DE	REMOVE SONY TV RECEIVERS FROM 2ND & 3RD FL VIP ROOMS	12/17/69	1/5/70
4231D	INSTALL HARDCOPY CAPABILITY ON RIGHT MONITOR - CSL 91	1/19/70	2/6/70
4232T	INSTALL SEISMIC RECORDER ALARM - AMEND 2		
4233D	MODIFY TV MONITOR SELECT MODULES - CSLS 62 & 65	1/29/70	2/5/70

ENGINEERING ORDERS
AS- 508-H2

E. O. NO.	DESCRIPTION	I AND C	TEST
4238T	PROVIDE 2 ADDTL PARAMETERS TO BL45 FROM PCMGs	3/27/70	3/31/70
4611C	POWER DISTRIBUTION RECONFIGURATION - CONSOLE COMM SUBSYSTEM	1/22/70	2/8/70
4614C	INSTALL 2 DECODERS ON TRANSMIT SIDE MSFN	1/16/70	3/23/70
	INSTALL COUNTERS IN CONSOLE 59	3/16/70	3/23/70
4619C	MODIFY 8 RACK MOUNTED KEYSETS - FOR STOCK		N/A
4624C	PERMANENTLY INSTALL SINGLE LOOP JACK BOXES	3/25/70	3/26/70
4625C	RACK MOUNT PORTABLE BIO-MED RECORDER	3/27/70	
4631C	SCU WIDE BAND INTERFACE	1/20/70	2/27/70
4635C	INSTALL HORIZONTAL KEYSET - CONSOLE 29	1/5/70	1/5/70
4636C	CONFIGURE CERTAIN A/G LINES FOR CLS APPEARANCES	12/15/69	12/22/69
4638C	SUPPLY 12 VOLT POWER SUPPLY FOR ASCATS	2/25/70	3/31/70
4641C	INSTALL HORIZONTAL KEYSET - CONSOLE 48A	12/30/69	1/14/70
4643C	PROVIDE COMMUNICATIONS CAPABILITY FOR SCU	12/23/69	1/6/70
4650C	INSTALL RACK TYPE KEYSET - OPAQUE TELEVISOR	3/6/70	3/23/70
4659C	INSTALL ON/OFF SWITCH ON PA SPEAKER		
	INSTALL SINGLE LOOP JACK BOX	3/27/70	
4661C	PROVIDE COMM REQUIREMENTS FOR RIGHT HAND BOOTH OF VIEWING ROOM	3/27/70	
4662C	REARRANGE SINGLE LOOP JACK BOXES		
4903B	PROVIDE 2 TRANSLATOR RACKS	1/30/70	2/9/70
6201S	PROVIDE STREU FOR ALSEP INTERFACE TO MSFN	1/2/70	1/20/70
6222SE	INSTALL COVERS ON (2) EPO MASTER SWITCHES	3/27/70	

ENGINEERING ORDERS
AS - 509 H-3

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PHO-TR474

1.2 ORGANIZATION

The organizational structure for Contract NAS 9-1261 remained unchanged as reflected in Figure 1-1.

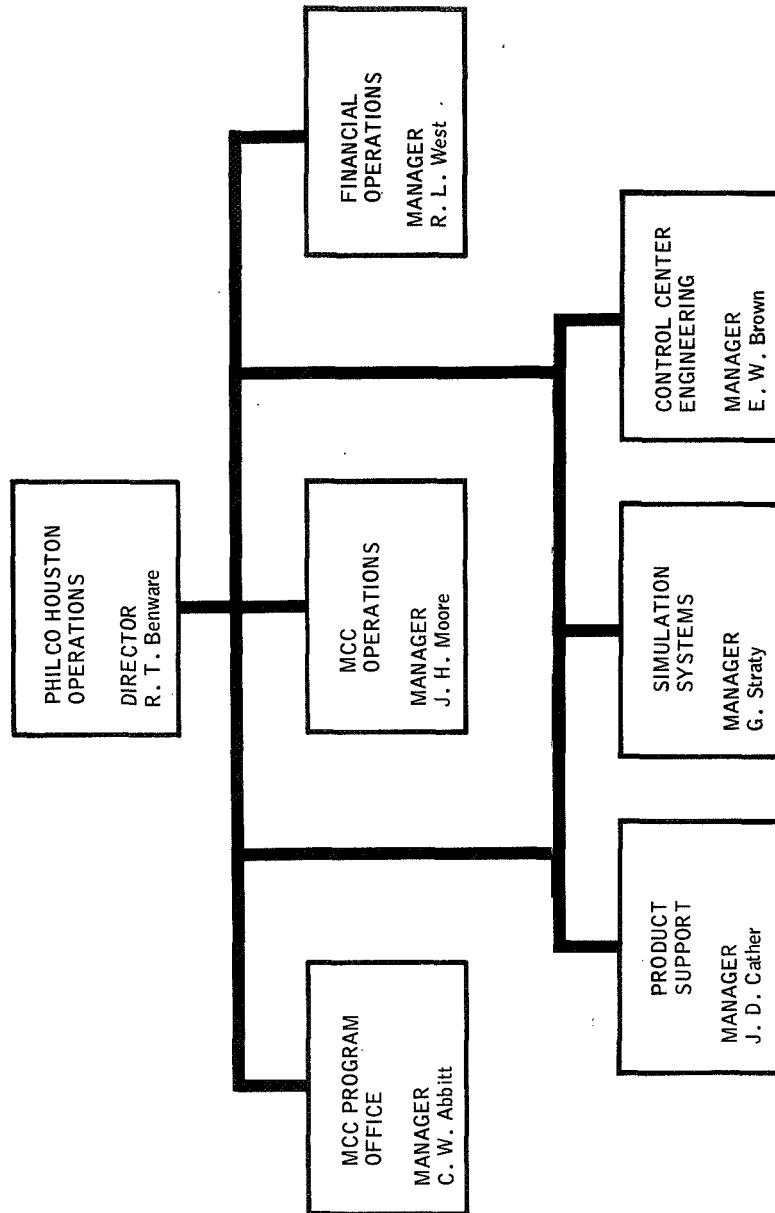


Figure 1-1 PHO Organization and Managerial Structure

SECTION 2

MISSION PREPARATION AND OPERATIONS

2.1 MCC MAINTENANCE AND OPERATIONS

2.1.1 Progress During Quarter

2.1.1.1 MCC Reconfiguration

- A. The Display System Mission H-2 configuration is in accordance with PHO-TR155, Revision C. Revision C was implemented in March; however, no equipment configuration changes were necessary. Other activity this quarter included implementation of PHO-TR155, Revision B, during February and two MRR's connect changes and 1126 console label changes.

The Communications System Mission H-2 reconfiguration now totals 1379 CCS PBI changes and 1455 CCS label changes. Monthly figures are: January - 156 CCS PBI and 156 CCS label changes; February - 222 CCS PBI and 222 CCS label changes; March - 352 CCS PBI and 352 CCS label changes. Implementation of priority modifications is proceeding in accordance with the PHO schedule.

- B. ASCATS is configured in accordance with the Lunar Landing Mission SDAR, PCN 1 and 2. There were no configuration changes during this quarter.
- C. A total of 37 EO's were implemented, tested and signed off; 2490 man-hours were expended in this effort.
- D. Four EWO's were implemented, tested and signed off; 42 man-hours were expended in this effort.

2.1.1.2 Preventive Maintenance

- A. All scheduled preventive maintenance routines were satisfactorily completed, PM logs annotated, and maintenance management audits performed.

- B. Monthly test equipment calibration dates and custodial lists were prepared, distributed, and necessary calibration/repair action initiated. Test equipment is 92.0 percent in service with 28 items out for calibration or repair during March.
- C. There was one minor industrial accident reported this quarter; no time was lost.
- D. Fire and safety inspections were conducted in conjunction with NASA personnel. Discrepancies noted were minor in nature, such as mission fire extinguisher locators, and have been noted and submitted to NASA for resolution by the appropriate organization.
- E. During the quarter 12 new Preventive Maintenance Instructions (PMI's) were added to the M&O Maintenance Program and 24 PMI's were revised to incorporate equipment changes and improved maintenance techniques.
- F. Six Standard Maintenance Procedures (SMP's) were revised during the quarter to reflect improved methods of maintenance and operations.

2.1.1.3 Equipment Performance and Failure

- A. Equipment performance was satisfactory and proper support was provided for ALSEP-1 mission, Mission H-2 mission program development, validation tests and simulations, and Mission H-3 and ALSEP-3 program development.
- B. M&O maintenance analysis Quick-Look Reports for December 1969, January 1970 and February 1970, based on trend data extracted from Trouble and Failure Reports, were distributed during the quarter. The March report is scheduled for completion 10 April. A total of 1282 Trouble and Failure Reports were prepared, analyzed and coded.

- C. Forty-one M&O change suggestions were submitted to PHO to improve the performance, reliability and maintainability of MCC equipment.
- D. A total of 2291 Work Order/Discrepancy Reports were initiated by M&O personnel this quarter.

2.1.1.4 Software Development

- A. Prepared and delivered one revised Mission H-2 PCM 102 program, thirteen updated Mission H-2 MDD programs and six Mission H-2 MODE programs.
- B. Seven new Mission H-3 MDD programs and two revised programs were prepared.
- C. Developed and delivered two new Mission H-3 MODE Programs.

2.1.1.5 Operational Readiness Tests and Plans

- A. Issued Changes 9 and 10 to the *MCC M&O Support Handbook*.
- B. Reviewed ALSEP-3, Mission H-2 simulation and pad test support counts and forwarded M&O comments to the FSD Operations Section.
- C. Assisted the FSD Operations Section in preparing MCC overall system trouble isolation flow diagrams.
- D. Issued Change 2 to the *Flight Support Operation Handbook*, Volume III.
- E. Issued Change 8 to the *MCC Validation Testing and Support Manual*, Volume II.
- F. Conducted 10 display ORACT and 10 open loop ORACT tests this quarter for the third-floor MOCR system.
- G. Conducted 10 ALERT tests this quarter for the ASCATS system.
- H. Conducted 13 pre-sim tests this quarter for the ASCATS system.

2.1.1.6 Operation Support Provided

- A. RTCC program development and checkout for Missions H-2, H-3 and ALSEP.
- B. CCATS telemetry, command and DGEN program development and checkout for Mission H-2 and H-3.
- C. Mission H-2 ORACT program checkout.
- D. GSSC and APCU program development and checkout for Mission H-2 and Mission H-3.
- E. Mission H-2 network validation testing.
- F. A total of 41 Mission H-2 simulations.
- G. A total of four Mission H-2 pad tests.
- H. ALSEP-1 mission support.
- I. Mission H-2 MCC internal validation tests.

2.1.1.7 Training

- A. There were no soldering certification classes conducted during this quarter. Currently, 121 M&O personnel are certified in accordance with the provisions of HHB53D0-4 (3A); of these, 42 require recertification. An additional five personnel have been identified to be certified in high reliability soldering. Current soldering certification status is 96 percent.
- B. Continued progress on the M&O certification program during this quarter. Thirty-nine personnel were cross-trained and certified for alternate positions. All M&O Department personnel requiring certification are certified; current job readiness percentage is 100 percent for all subsystems.
- C. Conducted M&O site drills for Mission H-2.

- D. Inserted M&O simulated equipment problems during flight control simulations for training of M&O and other affected MCC personnel.
- F. Conducted classes on the proper completion of Trouble and Failure Reports (TFR's) for all M&O personnel.
- G. Conducted classes on digital logic fundamentals and 4-D micrologic for 16 M&O personnel.
- H. Two FACS men attended a vendor class in Arizona on the Motorola high-speed printer.
- I. Formal classes were conducted during the quarter on 10 types of equipment.

2.1.1.8 Travel

R. Gordy and W. Jones attended a vendor class at Scottsdale, Arizona, 19 and 20 March 1970 on the Motorola high-speed printer.

2.1.2 Problem Areas

No major problems exist.

2.1.3 Plans for Next Quarter

- A. Support Mission H-2 flight control and flight support activities.
- B. Continue routine maintenance and support functions.
- C. Continue proficiency and cross-training programs.
- D. Conduct additional classes on the system configuration unit and digital television equipment.
- E. Prepare Mission H-2 Quick-Look Reports and the M&O mission performance report.

2.2 MAINTENANCE MANUAL REVISION

2.2.1 Progress During Quarter

- A. Manual Edition Order No. 4, Schedule II. This effort was completed this quarter with the delivery of PHO-EM272 in February.
- B. Manual Edition Order No. 3, Schedule III. This effort is approximately 99 percent complete. The only deliverable item remaining is PHO-EM712, which is scheduled for delivery on 3 April.
- C. Manual Edition Order No. 1, Schedule III, Option 1. This effort is approximately 88 percent complete. There are three new manuals and one change manual remaining. The pacing manual is PHO-EM627, which is scheduled for delivery on 24 July.
- D. Manual Edition Order No. 2, Schedule III, Option 1. This effort is approximately 61 percent complete. There are three new manuals, one revision manual, and eight change manuals remaining. The pacing manual is PHO-EM613, which is scheduled for delivery on 30 July. The following deliveries were made during the quarter:
 - PHO-SM001, final change pages
 - PHO-SM106, final change pages
 - PHO-EM116, final change pages
 - PHO-EM117, final change pages
 - PHO-EM144, final change pages
 - PHO-EM146, final change pages
 - PHO-EM275, preliminary manual

- E. Manual Edition Order No. 3, Schedule III, Option 1. Work commenced on this MEO during the quarter, and the effort is approximately 12 percent complete. Three new manuals, five revision manuals, and 18 change manuals are included. The pacing manual is PHO-SM103, which is scheduled for delivery on 13 November. Review change pages for PHO-EM224 were delivered during the quarter.

2.2.2 Problem Areas

No major problems exist.

2.2.3 Plans for Next Quarter

Delivery of the following manuals is planned for the next quarter.

- PHO-EM272, final manual
- PHO-EM150, final manual
- PHO-EM273, final manual
- PHO-EM628, final manual
- PHO-EM275, final manual
- PHO-EM151, final manual
- PHO-EM277, final manual
- PHO-EM278, final manual
- PHO-SM206, final change pages
- PHO-SM205, final change pages
- PHO-EM140, final change pages
- PHO-EM220, final change pages
- PHO-EM263, final change pages

- PHO-EM611, final change pages
- PHO-SM105, final change pages
- PHO-SM701, final change pages
- PHO-EM001, final change pages
- PHO-EM224, final change pages
- PHO-SM202, review change pages
- PHO-SM204, review change pages
- PHO-EM118, review change pages
- PHO-EM131, review change pages
- PHO-EM241, review change pages
- PHO-EM135, preliminary revision manual
- PHO-EM142, preliminary revision manual
- PHO-EM627, preliminary new manual
- PHO-EM276, outline

2.3 LOGISTICS FOR MCC SYSTEMS

2.3.1 Progress During Quarter

- A. Completed 48 engineering orders.
- B. Updated 230 line items in the *Equipment List*, PHO-TR107.
- C. Completed 221 parts lists and revised 183.
- D. Researched and wrote 11,571 line items for the Description File and deleted 473 incorrect items.
- E. Researched and added 765 cross references to the Inter-changeability File.
- F. Submitted 54,374 line items to keypunch.
- G. Revised and determined the repairability code for 11,098 line items.
- H. Submitted the January, February and March Spares Status Reports to NASA.
- I. Submitted the February and March ASPL Addendums to NASA.
- J. Disposed of 8186 pounds of scrap to Ellington AFB.
- K. Transferred 25 vacuum tubes to Ellington AFB for destruction and disposal.
- L. Disposed of 24 plant clearance cases to Ellington AFB.
- M. Submitted 5 plant clearance cases to the NASA for disposition instructions.
- N. Thirteen plant clearance cases are in the process of being submitted to the NASA for disposition instructions.
- O. Disposition instructions have been received on five plant clearance cases and we are now awaiting delivery instructions from Ellington AFB.

- P. Submitted results of the 1969 Fourth Quarter Cycle Inventories of M&O Spares and EO Materials.
- Q. New training programs are being developed and implemented in all sections of the department.
- R. The warehouse rearrangement has been completed, for all intents and purposes. This effort has resulted in a much more efficient warehouse and has provided us with additional storage space. This space is being rapidly filled, however, due to the removal of equipment from Bldg. 422.
- S. We have adopted a new approach in the screening of obsolete, surplus and excess material, and are at present screening PHO and NASA concurrently. We feel that we are providing more descriptive information on each item of material, thereby making it easier to determine whether the item is further required.
- T. We have revised Materials Management Operating Instruction No. C-003, "Receiving Materials into PHO."
- U. The results of the First Quarter 1970 Cycle Inventories were submitted approximately 5 April 1970.
- V. Bldg. 30 replacement parts for the quarter were as follows:
 - Items requested by M&O technicians - 3544
 - Items delivered to M&O technicians - 3517 (99 percent)
 - Items issued from substores stock - 3266 (92 percent)
 - Items ordered from Logistics Distribution Center - 278
 - Items received from Logistics Distribution Center shelf stock - 182 (65 percent)
 - Items backordered - 278
 - Items remaining on backorder - 27

2.3.2 Problem Areas

No major problems exist.

2.3.3 Plans for Next Quarter

- A. Submit the April, May and June Spares Status Reports.
- B. Submit the April, May and June ASPL Addendums.
- C. Continue cycle inventory effort..
- D. Continue to dispose of excess, surplus and obsolete material.
- E. Continue training programs throughout the department.
- F. Continue to parts list, spare and add or update items in the *Equipment List*, PHO-TR107, as defined by engineering orders.
- G. Continue to concentrate on the development of more cost reductions.

2.4 OPERATIONAL CONFIGURATION DOCUMENTATION AND TESTING

2.4.1 Progress During Quarter

2.4.1.1 Operational Configuration Documentation (PHO-TR155)

A. Mission H-2

1. Delivered PHO-TR155 revisions to Data Control for publication on 6 and 27 February and 20 March.
2. Issued PHO-TR155 outputs; Revision A on 23 January, Revision B on 13 February and Revision C on 6 March.
3. Provided data pack Revision J on 2 January, K on 16 January, L on 30 January, M on 13 February, and N on 6 March.

B. Mission H-3

1. Delivered RTCC card deck on 16 January.
2. Issued data pack Revision C on 20 February and Revision D on 27 March.

C. Mission H-4. Provided data pack Revision A on 23 January and Revision B on 20 March 1970.

D. ALSEP Mission. Issued data pack Revision C on 14 January and Revision D on 6 March.

2.4.1.2 Configuration Testing (ORACT)

- A. The documentation and training program for M&O personnel on COST II is in progress.
- B. A study is being made concerning further consolidation of ALSEP into display control.
- C. Delivered program requirements for testing the SCU. They included test control and data requirements with a general description of total SCU interface testing.

- D. Updated D/C and O/L systems to Rev. A and B of PHO-TR155.
- E. Provided test engineering assistance to IBM relative to 360/ACIU/494 interface.
- F. Provided test engineering support for the following EO's: 3294, 3520, 3530, 4101, 4104, 4116, 4201, 4210, 4222 and 4226.

2.4.2 Problem Areas

No major problems exist.

2.4.3 Plans for Next Quarter

2.4.3.1 Operational Configuration Documentation

A. Mission H-3

1. Deliver initial publication and the first revision of PHO-TR155 to Data Control.
2. Provide initial output and Revisions A and B of PHO-TR155.
3. Issue data pack Revisions E thru I.

B. Mission H-4. Provide data pack Revision C.

2.4.3.2 Configuration Testing

- A. Provide support for M&O and EO testing as necessary.
- B. Continue training of M&O personnel.
- C. Continue working with NASA on consolidation of test programs.

2.5 QUALITY ASSURANCE AND RELIABILITY

2.5.1 Progress During Quarter

A. PHO Facility Activities.

1. Material Review. Made disposition on 99 RMR's and 229 TFR's.
2. Receiving Inspection. Inspected 1136 line items representing a total of 118,818 component parts.
3. Supply Requisitions. Reviewed, coded and processed 919 SR's.
4. In-Process Inspection. Performed inspection to 23 cabinet/console assemblies, 17 drawer/module assemblies, and 1087 printed circuit assemblies.
5. Condition Coding. Condition-coded 1261 line items for plant clearance.
6. Calibration Control. Initiated request on 83 pieces of equipment and completed calibration on 59 pieces of equipment. Inspected and verified 95 special process tools.
7. Design Reviews. Participated in six final and six conceptual design reviews.
8. Corrective Action Requests. Initiated 38 CAR's and took corrective action on 25 during the month.
9. Costing Meetings. Attended one costing meeting.
10. NASA Alerts. Received 42 NASA Alerts; closed 39.
11. Acceptance Tests. Performed 13 acceptance tests.
12. Documentation Review. Reviewed 29 specifications for final signoff.

B. Site Activities.

1. Modification Completion and Validation Report (MCVR) Status. Completed 47 MCVR's during the reporting period.
2. Test Witnessing and Workmanship Inspections.
 - a. Performed 53 tests with satisfactory results for the following EO's: 3510, 4102, 3294, 3684, 4629, 4204, 1880, 4226, 4222, 6180, 4641, 3530, 3294, 3520, 4614, 3058, 3030, 4616, 4210, 3059, 4644, 3502, 1887, 6214, 6209, 4201, 4223, 4649, 4231, 4611, 4903, 4903, 4117, 4116, 4631, 4104, 4201, 4904, 1871, 1872, 4624 and 4614
 - b. Made 67 in-process inspections to 17 EO/TO's.
 - c. Made 35 final inspections to 32 EO's and accepted workmanship.
 - d. Made four final inspections to four EWO's and accepted workmanship.
 - e. Issued six DN's, closed eight, and 38 are outstanding.
 - f. Issued 77 TFR/RMR's, closed 76 and one is outstanding.
 - g. Made disposition on 846 TFR expendables.
3. Receiving Inspection. Performed 328 inspections with acceptance granted to 340 major line items.
4. Shipping Inspections. Performed 237 inspections with shipping authority granted to 593 line items.
5. MRB Action. Held 15 formal and 31 informal Material Reviews.
6. Maintenance. Inspected and accepted workmanship on 1209 maintenance work orders.

7. Reconfiguration. Performed 100 percent inspection to 1756 configuration changes to the communications main distribution frame.
8. Personnel Certification. Certified four and recertified seven M&O personnel to perform hand soldering.
9. Critical Equipment Access Control. Performed 35 inspections.
10. Auditing. Surveyed 13 subsystems in accordance with the MCC Quality Assurance Systems Survey.

C. Special Activities.

1. Continued second-floor deactivation program.
2. Wrote SR Review QCI.
3. Inspected NASA slide file cabinet doors and side panels at Ambox.
4. Attended acceptance test at Hazeltine and discussed coverage with H. Marler of NASA. Reviewed Hazeltine's final QA Plan and found a discrepancy between this plan and the agreed-upon version.
5. Attended the Soldering Technology Seminar in Chicago on PCB's.
6. Prepared and submitted a change to QA/OP 204, "Supplier Rating System."
7. Submitted a list of certified (soldering) manufacturing technicians to J. Henry.
8. Prepared repair procedures on PC boards for proposed Standard Repair Manual.
9. Conducted an adhesives study on joining of metals and issued a report.

10. Completed initial survey for Mission H-2 System Survey.
11. Reviewed PCB Design and Fabrication Spec for NASA printed circuit boards.
12. A quick reaction "NASA Alert" response form has been generated.
13. A study was made of the LTV stylus plates problem.
14. Completed draft of Configuration Index.
15. Investigated defective PCB's in EO-3968 SCU Controller Cabinet.

2.5.1.2 Reliability Engineering

A. EO/TO Support

1. Completed final documentation (PHO-TN308) of the reliability analysis on the changes and additions to the high-speed printer equipment (EO-4903).
2. Evaluated design modifications to the restart control module (EO-4223) and updated the reliability predictions to reflect minor modifications.
3. Completed a comparative analysis between the existing electrical power distribution systems in the Mission Operations Wing of Building 30 and the power monitor and control system proposed by EO-1883. This is a being documented.

B. Special Projects

1. Completed preliminary documentation (PHO-TN309) of the failure analysis on the logic card connector block. An investigation by London Chemical Company to determine a feasible and economical means of cleansing the connector remains in progress.

2. Completed final documentation (letter 2-701-1A-70-40, dated 21 January 1970) of the stress analysis on the console monitor modification proposed by Change Suggestion No. 602.
3. Reviewed incoming ALERTS for applicability at MSC. As required, the Unqualified Parts List was updated and design application notes (see PHO-TR472) were originated. Completed procedure for handling ALERTS and problem reports in general.
4. Failure mode analysis on a 2N1554 transistor manufactured by Electronics Transistor is in progress. Two of these transistors were reported as being bad from stock. Visual examination shows internal damage due to a broken transistor chip mounting bracket. The logistics supply has been purged and future procurement action delayed until a thorough investigation can be completed.
5. Failure mode analysis on the Tec Lite continues. A circuit stress analysis verified that all components are operating within rated values.
6. Documentation of a test plan for a repairability study of the SCU logic cards is being prepared.
7. Continued development of the PERP system of computer programs to be used to summarize MCC failure and repair statistics. Approximately 95 percent of the effort has been completed on modifying the edit, controller, and CEPS program to accommodate the TFR format and to decrease the running time of these programs. Approximately 80 percent of the effort has been completed toward incorporating these changes, plus changes to correct for file search and part population calculation problems, in the subsystem component parts performance summary program.
8. Made additional corrections, added MTBF's, and added records to the PERP master reference files.

9. Continued effort with QA, Logistics, M&O, and Program Office to reconcile discrepancies in equipment tags.
10. Completed modifications to the following PERP routines; dump files (DSF), QA prefix (OAPX) and load files (FLOAD).
11. PERP file development support routines were initiated. The utility sort routine is 100 percent complete; the utility tape modify and failure file format converter routines are 50 percent complete.
12. PACER (Programmed Analysis and Calculation of Equipment Reliability) runs based on improved part failure rate predictions were completed for the AVSM, D/TV Buffer, VSMBM, CCATS, CIM, VSM, SCU, RCM, DDD/SDD, WDL logic cards, 4D logic modules, and lambda power supplies. This provides PERP file update cards, and therefore completes the baseline failure rate prediction effort for these operating assemblies.
13. Coding of the baseline piece part/component failure rate data for a PACER update of the micrologic digital display drivers is in progress.
14. Baseline modeling and analysis of the CCATS digital display string is in progress.
15. Processed approximately 1900 failure records for the equipment performance reports for the three months of the quarter.

2.5.1.3 Travel

Quality Assurance personnel made 13 local and five distant trips.

2.5.2 Problem Areas

No major problems exist.

2.5.3 Plans for Next Quarter

- A. Quality Assurance. Continue material review, various inspections, condition cooling, calibration control, acceptance tests, test witnessing, MRB action, personnel certification, and surveys as required.
- B. Reliability Engineering. Continue TFR processing, baseline analysis and predictions, and failed parts investigations as required, and complete PERP.

2.6 INSTALLATION OF MCC SYSTEMS MODIFICATIONS AND RELATED INSTALLATION TASKS

2.6.1 Progress During Quarter

2.6.1.1 Design

- A. Completed and released 59 installation design packages for installation tasks on 41 EO/EWO's.
- B. Forwarded final installation design documentation to Drafting, Data Control and/or Configuration Control for 58 EO/EWO's.
- C. Generated and released five reconfiguration cross-connect listings for Mission H-2.
- D. Released information for revising and updating 71 master cable and CTC cross-connect lists.
- E. Forwarded inputs monthly to Configuration Control to update tab runs for PHO-TN121 through PHO-TN123.
- F. Received 44 new EO's for installation. Installation cost estimates were prepared for 45 EO/EWO's.
- G. Generated and released EI's and task statements for five EO's.

2.6.1.2 Implementation

- A. Completed installation tasks for 39 EO/EWO's.
- B. Partially completed installation tasks for 37 additional changes.

2.6.2 Problem Areas

No major problems exist.

2.6.3 Plans for Next Quarter

Continue implementation of approved EO's as equipment deliveries and operational commitments allow.

SECTION 3

ENGINEERING

3.1 MCC SUPPORT

3.1.1 General TO-820, FSD General Task

A. Document Management

1. TO-820 Documents Update. The efforts performed to accomplish this task are outlined as follows:
 - EO's reviewed and reported in EO/EWO Status - 134
 - EO manual update requirements reported - 39
 - EO's cleared of manual requirements - 28
 - EO's reported, categories "L" & "R" - 39
 - EO's (effects of) incorporated in final manual deliveries - 64
 - IP's published - 6
 - Vendor manuals reviewed - None
2. TO-820 Deliveries. There were no deliveries during this quarter.

- B. CML Control and Status. Fifteen out-of-scope material requests (PHO Form 4730) were submitted during this period. The CML Status Reports (40 copies) of Schedule III, Option I EO material list authorization were distributed on 15 January, 15 February, and 12 March 1970.

C. CAD System Analyst

1. Provided consultation to PHO programmers regarding CAD software systems.

2. Started a study of the 4060 Plot Package as called from COBOL.
3. Provided technical assistance for a presentation to NASA on PHO-TR155 processing.
4. Upgraded programs under Projects 6507 and 6508 to utilize a new Sort Package.

D. Wire Listing Program Maintenance and Coding. There was no program maintenance performed this quarter. Coding of DW-14155, Revision 1 was completed 3 February 1970; the DW-14373 original was completed 25 February, and DW-14373, Revision 1 is in progress.

3.1.2 Specific TO's

None

3.1.3 Engineering Orders

- A. EO-1871. The modification was implemented and tested 7 March 1970. The remaining effort is the completion of all drawings, manuals and the MCVR.
- B. EO-1872. The requalification test was completed on 16 March.
- C. EO-1876. EI No. 2 was released on 13 March. Procurement is in process.
- D. EO-1881. The design and cost package was submitted to NASA on 21 January.
- E. EO-1883. The design and cost package was submitted to NASA on 12 March
- F. EO-1885. Activities have ceased pending NASA action.
- G. EO-1886, Redistribution of Power in the MCC to Increase Reliability. Preliminary design review on 6 February EI No. 2 released 20 February. Final design review on 21 February.

3.2 SYSTEMS ENGINEERING

3.2.1 General TO-3000, Display Engineering

A. Specific TO's

1. TO-3013, PAO Switching Analysis. This study was received on 29 January and is in progress.
2. TO-3014, Draft System Study. This study was received on 2 February and is in progress.
3. TO-3015, Recovery Room Improvements. This study was received on 19 March and is in progress.

B. Specific EO's

1. EO-4014, NTSC Color Converter. This EO authorizes procurement of the converter specified under TO-3005. Specifications PHO-SP-09277 and SW-09277 were submitted to vendors on 16 January. Evaluation of proposals was completed on 2 March. Negotiations are currently in progress.
2. EO-4016, Hot Cassette Modification Kit. EI No. 1 was released on 4 November 1969 to purchase the kit. Installation was completed on 29 December. No schematics or wiring diagrams were received for this equipment from the vendor.

EI No. 2 was released on 24 February to provide documentation, installation instructions and minor parts to make the retrofit kit compatible with the projector. This documentation is in progress.
3. EO-4024, Additional TV RF Feeds. This EO was installed and tested on 14 November. Final documentation is in progress.
4. EO-4028, D/TV System for MPAD. This EO is dependent upon completion of repairs to GFE D/TV System. Engineering checkout of the system is in progress.

MSFC D/TV Equipment

5. EO-4029, Additional TV Room 210, A&B. EI No. 1 was released on 5 February. Amendment 1 was received on 19 March. EI No. 2 was released on 25 March. Installation is complete. Testing is in progress.
6. EO-4030, Inhibit for Commercial TV. This EO was initiated by NASA on 6 February and was received on 10 March. EI No. 1 was released on 17 March. Installation was completed on 27 March. Testing is in progress.
7. EO-4031, Additional TV Feeds. This EO was initiated by NASA on 10 February. EI No. 1 was released on 6 March. Installation was completed on 27 March. Testing is in progress.
8. EO-4032, TV Pool Output. This EO was received on 24 March. EI No. 1 was released on 26 March. Installation and testing is in progress.
9. EO-4033, Installation of GFE Color TV Camera. This EO was received on 27 March. Installation dependent on receipt of GFE camera which was scheduled for 1 April 1970.
10. EO-3111, Modification of Color TV System. EI No. 9 was released on 10 March to complete final tasks and documentation efforts under this EO. Equipment provided under EI No. 8 was installed on 30 March. Final testing is in progress.
11. EO-3120, Alphanumeric Display Unit. Fabrication is complete. Engineering checkout was completed on 23 March. System checkout and compatibility testing is in progress.

3.2.2 General TO-3100, Timing and Control Engineering

A. Specific EO's

1. EO-4101, Command Capability for Console 4, Both Floors. EO received 8 July 1969. Third-floor installation completed 20 August; third-floor testing completed 5 September 1969. Second-floor testing completed 16 February 1970.

2. EO-4104. Reconfiguration of DDD/SDD Power. EO received 3 July 1969. EI No. 1 released 25 August. Second-floor RT's completed 4 March 1970. Final documentation in progress.
3. EO-4113. Changes to CCIM-SCU Cable Interface. EO received on October 1969. Installation completed 9 December 1969. Final acceptance in 7 January 1970. Final documentation in progress.
4. EO-4115. Changes to CCATS SDD-SCU Cable Interface. Installation completed 9 December. Final acceptance on 7 January. Final documentation in progress.
5. EO-4116. Addition of ALCIM to the HSP Interface. EO received 21 November. It has a B2 priority. Installation completed 11 February. Requalification test completed 20 February. Final documentation in progress.
6. EO-4117. PPS for the TSU. Received 18 December. Test completed 16 February. EI No. 2, for documentation only, released 17 March. Final documentation in progress.

3.2.3 General TO-3200, Telemetry Engineering

- A. Specific TO's. None
- B. Specific EO's

1. EO-4201, Modification to Consoles 2, 4, 20, 23, 24, and 31. EO received 8 July 1969. Operational need date for Mission H-1. Third-floor Consoles 4 and 23 installation complete. The TTY move and recorder has been installed. Third-floor CCATS final test completed 17 September 1969. Third-floor RTCC final test was completed 8 October 1969. Second-floor installation and testing complete, excepting the recorder, which is being installed.

2. EO-4207, Redundant Power Supplies for Console 79.
EI No. 1 released to PMO 1 August 1969. Power supplies reworked in Manufacturing, tested, delivered, and installed in the console 26 August. EO reopened on 9 October to increase maintainability.
3. EO-4211, Replacement of Regulator Circuits on Console Power Supplies. EO placed in "cost but do not implement". Removed from hold and all departments authorized to implement by EI No. 3, released 20 February 1970. Work is progressing according to schedule.
4. EO-4222, Reconfiguration of Console 29. This had an operational need date of 29 December 1969 and a B2 priority. EO received 21 October 1969. RT completed 6 January 1970. Final documentation is in progress.
5. EO-4223, Modification to the Restart Control Module.
EO received 22 October 1969. Ready for testing 20 January 1970. Placed in NASA hold on 23 January. Cable crosstalk problems experienced. Existing cables had been replaced with shielded cable, but not connected to interface as of 22 January.
6. EO-4230, Addition of A19 SMEK to Console 21. Received 5 January 1970. SMEK is now in fabrication, scheduled to complete in mid-April.
7. EO-4231, Installation of Hardcopy Capability on Console 91. Received 31 December 1969. Final test completed 6 February 1970. Final documentation in progress.
8. EO-4232, Audio Tone Generator for Seismic Drum Recorders.
EO received 9 January. It has a B3 priority and is needed prior to Mission H-2. In NASA hold as of 19 February 1970. Removed from NASA hold 24 March by Amendment No. 1. Engineering efforts in progress.
9. EO-4233, Changes of Channel Attach Capability on Consoles 62 and 65. EO received 9 January. This had a B1 priority and an operational need date of 27 January. RT conducted on 5 February. Final documentation in process.

10. EO-4234, Reconfiguration of Console 45A. EO received 19 January. Installation scheduled after Mission H-2.
11. EO-4236, Filters for Cardiotach Noise. EO received 22 January. Preliminary EI No. 1 released on 26 February. Awaiting 4730 approval to proceed.
12. EO-4237, Transferral of RTCC Predicted Guidance Mode Control to Console 11. EO received 25 March. EI No. 1 is being prepared.
13. EO-4238, Installation of Two VCO's in Room 129. Advance copy of EO received on 20 March with B priority. Installation complete 27 March. Test was to have been completed in week ending 3 April.

3.2.4 General TO-3400, Digital Television Engineering

- A. Specific TO: TO-2402, Alphanumeric Display Cluster Design. Engineering checkout was completed on 23 March under EO-3120. This TO was terminated on 2 March.
- B. Specific EO's

1. EO-4400, DTE Implementation. EI No. 1 was released on 15 January to provide all the necessary task statements for the implementation of the DTE cluster initially to the second-floor system, and also the final reconfiguration to the third-floor system. This EO was terminated by NASA on 2 March.
2. EO-4401, DTE Procurement and Implementation. All DTE procurement, implementation, and testing activities were transferred to this EO by NASA EAN on 2 March. Formal acceptance testing of the eight-channel DTE cluster is scheduled to begin at Hazeltine Corp. on 11 April, with a projected ship date of 2 May 1970, 69 days behind schedule. All hardware required for DTE Implementation, checkout and qualification testing in Building 30 has been installed with the exception of one VDA frame. This was due to late delivery of VDA adapters, and the frame will be installed following completion of Mission H-2. A TPS will be performed

at that time. IBM has installed the 2701 BSA's and is performing qualification test program debug prior to DTE delivery.

3.2.5 General TO-3600, Communications Engineering

A. Specific TO's

1. TO-3600, CCS Power System Noise Investigation. In response to a NASA request, a study was made on the subject system and a report, PHO-TN426, submitted to the customer 19 February 1970.
2. TO-3600, KSC Circuit Return Loss Study. At NASA request, PHO conducted a series of tests to establish correlation between numerical return loss and subjective interfacing effect to users on the voice circuits used between MCC and KSC. A memo listing the test setup and results has been prepared. At NASA request, no formal results (TN, etc.) will be prepared.
3. TO-3600, TTY Interface with SCU. Meetings were held with NASA and PHO to investigate this possibility of routing the TTY circuits between FACS and the CP through the System Configurations Unit. Three methods were considered, and hardware manufacturers were contacted for state-of-the-art line isolation devices. Pulsecom and Atlantic Research can provide the necessary hardware.

B. Specific EO's

1. EO-4605, New CCATS PA Zone. This EO created a new CCATS PA zone by using the power amplifier from the second-floor viewing room and by purchase of two new power amplifiers, one to replace the one used, and one for a spare. The amplifiers are still not ready for installation, and it was recently learned that the second-floor viewing room is required for Mission H-2.

Consequently, effort is being expedited to get this job closed out before Mission H-2.

2. EO-4611, CCS Power Regrade. This job was satisfactorily tested on 8 February 1970. Only non-functional discrepancies remain.
3. EO-4614, Decoders for MSFN Transmit Lines. EAN received on 20 January 1970 to relocate counters from Item 65 to Console 59. EI No. 2, which tasked Display to install the counters, was released 28 January. In subsequent meetings, Display found that the waiver for paint color previously obtained for cabinet installation did not apply for consoles, and the rack adapters required paint and Southco fasteners. EI No. 3 was prepared and released by Display to take care of these items and install units in Console 59. EI No. 4 revised wiring instructions and removed filter capacitors in the ac line to each counter. Installation and checkout complete and EO signed off.
4. EO-4624, Permanent Maintenance Loop Jackboxes. This job was tested on 23 February 1970. Minor discrepancies were discovered; before correction, an EAN was received to modify this EO. Sign-off should be complete before Mission H-2.
5. EO-4625, Relocation of Bio-Med Recorder From Room 129 to 118. EI's were released, equipment relocated, manuals received and engineering evaluation completed per Design Review instructions. On evaluation, discrepancies were noted on the GFE recorders. Items found were broken switches, broken connectors, etc. NASA was informed and subsequently an EAN was received to repair the recorder before final testing. Precision Instruments has been contacted in reference to part numbers and information has been received. An EI has been released to purchase, install and finally checkout this recorder. Completion expected, if reasonable delivery can be obtained, by early April.

6. EO-4631, FACS/SCU Interface Implementation. EI's No. 1, 2, 3, 4, 5 and 6 have been implemented and checked out. All associated TPS's have been run and the EO signed off.
7. EO-4638, Modification to ASCATS 12 vac Supply and Installation A/G Filters. This EO was installed as received; an EAN was received to reconfigure filter assignment. Sign-off prior to Mission H-2 is expected.
8. EO-4657, Make Nine Additional Prototype TLM Cards. EI originally scheduled for early March release, was not issued due to need for additional coordination with NASA. Meeting was held 12 March; redirection was received and EI No. 1 released to buy parts.
9. EO-4660, Tone Generator Interface With Building 1. EO received on 10 March and EI has been released.

3.2.6 TO-3900, Data Format Control Book

3.2.6.1 Progress During Quarter

A. Telemetry Data Format Control Book (TDFCB)

1. Completed RTCC RFBL Program on 5 January.
2. Prepared and delivered on 5 January a master tape compare and FC compare between Mission H-1 Revision 4 and Mission H-3 original TDFCB's.
3. Prepared and delivered on 5 January a special LM FC listing for Mission H-3 TDFCB.
4. Delivered on 6 January a copy of Format 12 CCATS decom cards.
5. Delivered a new Mission H-2 Revision 3 master tape for GSFC on 9 January.
6. Prepared solution to IU/S4B decom problem on 12 January.

7. Completed and checked out modification to CCATS/DECOM program to handle IU/S4B decom problem on 15 January.
8. Prepared and delivered on 16 January the IU/S4B CCATS decom cards of Mission H-2 and four listings of card deck.
9. Modified special LM FC List Program to handle new requirements from Flight Control and checked out on 26 January.
10. Prepared and delivered Mission H-2 TDFCB, Revision 4, due 4 February, on 28 January. Deliverables include a master and two copies, tape copies, tape discrepancy letter, HS and WB requirements, special LM FC listings, FC listing and compare, index listing, and master compare.
11. Redefined new field on A/G card of master tape for SPC vehicle to contain the downlink vehicle or the RTCC buffer for which the parameter applies. Added this to Mission H-2, Rev. 4 master tape and will add it to Mission H-3, Rev. 1 and subsequent missions.
12. Checked all required LM measurements to establish any processing problems on 26 January.
13. Wrote Decom Sort Program to sort CCATS Decom cards on output sequence for checking purposes. Completed 21 January.
14. Checked Mission H-3 TDFCB PCMGS against PHO-TR155 on 23 January.
15. Prepared and delivered Mission H-3 TDFCB, Revision 1, due 15 February, on 4 February, including a master and two copies, tape copies, tape discrepancy letter, HS and WB requirements, FC listing and compare, index listing, and master compare.

16. Prepared and delivered master compare between Mission H-2, Rev. 4 and Mission H-3, Rev. 1 TDFCB's for DGEN on 9 February.
17. Checked Mission H-2, Rev. 4 TDFCB PCMGS against PHO-TR155 on 10 February.
18. Checked MCC Master Measurement Number List against Mission H-2, Rev. 4 and Mission H-3, Rev. 1 on 12 February.
19. Completed modification of MK90 to delete a check.
20. Completed modification of A/G to add associated vehicle to SPC Alpha list and checked out.
21. Completed modification of index to add associated vehicle to SPC index list.
22. Completed modification of Decom Merge to change last sort from buffer ID to vehicle.
23. Continued work on AAP A/G downlink lists.
24. Prepared a Format 30 and a master compare between Mission H-2, Rev. 4 and Mission H-3, Rev. 1 for RSDP on 18 March.
25. Prepared and delivered report on Skylab telemetry downlink characteristics and 75 copies on 20 March.
26. Rewrite of CCATS/RTCC and PCMGS to output list and RTCC cards completed. Run time on computer was reduced from 20-30 minutes to 5-10 minutes.
27. Continued work on program to do all checking and generations. Program will contain following routines:
 - XPAND 720
 - IU/S4B

- Duplicate channel check
 - Check RTCC double defines
 - Check PCMGS double defines
 - Generate SLV A/G words and frames
 - Generate CSM A/G words and frames
 - Generate LM A/G words and frames
 - Generate A/G bi-levels
 - Generate RTCC Seg. Nos.
 - Check Format 30 double defines
28. Program written to compare 80-column card decks or tapes.
29. Studied biomedical data compression.
30. Checked PHO-TR155 against Mission H-2 TDFCB, Revision 4, PCMGS and MEDable chart recorder predefined groups on 23 March.

B. Command Data Format Control Book (CDFCB)

1. Prepared and delivered master and four copies of ALSEP CDFCB Revision 2, Change 3, on 6 January, the date due.
2. Prepared and delivered CDFCB, Revision 5, on 9 January, the date due.
3. Prepared and delivered Mission H-3 CDFCB RTC card deck and two listings on 16 January, the date due.
4. Completed RTC List Program modification checkout.
5. Prepared and delivered command presentation drawings on 17 March.

- C. Tracking Data Format Control Book (TRK DFCB). Prepared and delivered TRK DFCB, Revision 5, due on 21 January, on 14 January.

3.2.6.2 Problem Areas

No major problems exist at this time.

3.2.6.3 Plans for Next Quarter

A. TDFCB

1. Prepare Mission H-2 TDFCB, Revision 5, and Mission H-3 TDFCB, Revision 2.
2. Begin preparation of Mission H-4 TDFCB original.
3. Continue work on program to combine XPAND-720, IU/S4B, duplicate channel, A/G generations and format, RTCC and G. S. double-defines.
4. Perform study to establish feasibility of outputting formats by frame rather than word, and SLV A/G channel list by word and frame rather than by channel code.
5. Rewrite of A/G in order to reduce running time and increase reliability.
6. Continue study of Skylab telemetry downlinks.

B. CDFCB

1. Continue work on study to determine feasibility of new RTC handling technique.
2. Prepare and deliver revisions and changes as required to the CDFCB and ALSEP CDFCB.
3. Maintain up-to-date Master Command Program, documentation and specifications.

4. Prepare and deliver Master Command Program tapes as required.
5. Maintain TTY Test Data Program and documentation.
6. Prepare and deliver TTY test data as required.

C. TRK DFCB. Prepare and deliver revisions to the TRK DFCB as required.

3.2.7 TO-3925, RSDP Programming Requirements

3.2.7.1 Progress During Quarter

- A. RSDP Unit personnel attended required FSD and FCD meetings to discuss RSDP program requirements, status, and problem areas.
- B. The following documents were written and published by the RSDP Unit:
 - DAP, Annex E. Vol. 2, Rev. 1, Change 3
 - DAP, Annex E, Vol. 2, Rev. 1, Mission H-2 Appendix, Change 2
- C. RSDP Unit personnel began development of DAP, Annex E, Rev. 2, and the Mission H-3 RSDP test procedures.
- D. RSDP Unit personnel wrote the following program change requests (PCR's):
 - PCR 16, Mission H-2 - Changes special function set assignments
 - PCR 17, Mission H-2 - Requires special processing of four new LM parameters
 - PCR 6, Mission H-3 - Implements TDFCB, Revision 1
 - PCR 7, Mission H-3 - Implements special processing of LM descent fuel quantity parameters.

E. The following test activities were supported by the RSDP unit:

- MCC/RSDP validation test on 8 January
- ALSEP validation test on 14 January
- MCC/TEX ALSEP validation test on 5 February
- MCC/MILA validation test on 13 February
- MCC/GDS interface test on 19 March.

3.2.7.2 Travel

Tom Hiser went to GSFC on 27-30 January to review telemetry requirements with GSFC personnel.

3.2.7.3 Problem Areas

No major problems exist.

3.2.7.4 Plans for Next Quarter

- A. Attend FSD and FCD meetings to discuss RSDP program requirements, status, and problem areas.
- B. Provide checkout support for Mission H-2, H-3, and ALSEP RSDP programs.
- C. Publish the Mission H-3 RSDP test procedures.
- D. Develop and coordinate RSDP program requirements for Missions H-2, H-3, and H-4, ALSEP and Skylab.
- E. Initiate changes to DAP, Annex E and Annex E-1 as required.

3.2.8 TO-3950, CCATS Software Support

3.2.8.1 Progress During Quarter

A. Program Development

1. Program Requirements For Digitized Biomedical Data.
Attended meeting with NASA personnel on 13 January 1970 and was advised to cancel the development of the CCATS program requirements for digitized biomedical data. Requirements which had been developed to this date were delivered to NASA.
2. Operational Program Test Requirements.
 - a. Developed and delivered an outline of *CCATS Operational Program Test Requirements* to NASA on 16 January 1970 for review and comments. Met with NASA on 3 February to discuss the outline submitted on 16 January. This effort was redirected with emphasis placed on NASA, Univac and Philco reviewing *CCATS Interface Simulation System Program Specifications* (SSB-201) and transmitting the inadequacies to the Support Systems Branch, as opposed to generating a complete set of requirements. The current schedule calls for inputs from NASA and Univac to have been furnished to Philco by 1 April 1970. They will be compiled with Philco's inputs and a rough draft provided to NASA on 15 April. Final delivery is scheduled for 1 May 1970.
 - b. Attended a CISS briefing conducted by NASA Support Systems Branch personnel on 20 February 1970. A new outline for *CCATS Operational Program Test Requirements* was delivered to NASA on 24 February. A cross-reference list of CISS tests and CCATS tests was delivered to NASA on 25 February. The cross-reference list was compiled by comparing the data requirements for each CCATS test against the capabilities of the CISS tests. A rough draft of *CCATS Operational Program Test Requirements*, less comments on the individual CISS tests, was provided to NASA on 5 March.

- c. Attended a meeting with NASA and Univac personnel on 17 March to discuss and compile telemetry test requirements.

B. Program Requirements Documentation

1. Program Requirements, Version IV. Copies of Change 3 of *CCATS Program Requirements, Version IV* were distributed to users on 9 January. Several unique CIM and DDD listings appearing in Sections 4, 5, and 6 of this document have been prepared for maintenance by the CCUAS Text Writer.
2. Program Configuration Requirements, Mission H-2. The masters for Change 2 of *CCATS Program Configuration Requirements, AS-508* were delivered to NASA on 8 January. Change 2 of this document was delivered to users on 9 February.
3. Program Configuration Requirements, Mission H-3. The masters for the original issue of *CCATS Program Configuration Requirements, AS-509* were delivered to NASA on 2 February. The masters were reviewed by NASA and returned with comments for additional changes. These changes were the result of recent requirements not available at the time of initial preparation.

C. Maintenance and Operation Support

1. Computer Center Emergency and Disaster Plan. Developed and delivered an outline of the CCATS Computer Center Emergency and Disaster Plan to NASA on 6 January. Initiated effort to develop the document after receiving NASA's comments.
2. Mission Support Personnel Certification Criteria. Delivered updated master of the Mission Support Personnel Certification Criteria document to NASA on 8 January.

3. Mission Support Personnel Qualification and Training Plan. Delivered a Mission Support Personnel Qualification and Training Plan to NASA on 16 January. This plan presents an approach for establishing and maintaining a training program that will satisfy the requirements set forth in *CCATS Mission Support Personnel Certification Criteria*.
4. Training Requirements Forecast. Delivered an outline for *CCATS Training Requirements Forecast* to NASA on 16 January for review and comments.
5. Training Implementation Plan. Delivered an outline for the Training Implementation Plan to NASA on 16 January for review and comments.
6. Mission Certification Book. Delivered an outline for *CCATS Mission Certification Book* to NASA on 16 January for review and comments.
7. SCU Operational Confidence Test Specification. Delivered master copy of the *CCATS/SCU Operational Confidence Test Specification* to NASA on 6 February.
8. CCATS/SCU Standard Operational Configuration Criteria. Revised the *CCATS/SCU Standard Operational Configuration Criteria* to reflect master and two Xerox copies of the document to NASA on 13 March.

3.2.8.2 Problem Areas

No major problems exist.

3.2.8.3 Plans for Next Quarter

A. Program Development

1. Develop the *CCATS Operational Program Test Requirements* document.
2. Provide development support for *CCATS Program Requirements, Version IV* as required.

3. Continue to maintain cognizance of the status of MCC display system development plans and the effect on the CCATS.

B. Program Requirements Documentation. Continue effort, as required, to update *CCATS Program Requirements, Version IV; CCATS Program Configuration Requirements, AS-509; GSFC/MSC Communications Program Interface Control Document* and *Communications Processor Operators Handbook*.

C. Maintenance and Operations Support

1. Provide updates for the CCATS Operations Directive as required.
2. Provide updates for *CCATS/SCU Standard Operational Configuration Criteria* to reflect revised mission and test requirements.
3. Deliver to NASA the revised CCATS Computer Center Emergency and Disaster Plan.

3.2.9 TO-3960, CCATS Hardware Support

A. Specific EO's

1. EO-3172. Installation completed 31 August 1969. TPS's completed on 30 September and 20 August. CCATS GFE riser removed 30 December. TPS completed 9 March.
2. EO-4903. Engineering checkout and acceptance test was completed on first cabinet 19 January. On-site checkout and pre-QT was completed on first cabinet 20 January, at which time it was placed on line for support. The second cabinet was acceptance-tested on 27 January and delivered to MCC on 29 January. Both cabinets were qualification-tested on 9 February. The MTP6000 printers were received and necessary drawings generated to attach the paper take-up reels. Several defective interface cards were replaced by the vendor. The printers are in Manufacturing being fitted with take-up reels.

Acceptance of the MTP6000 is independent of the cabinets and will be performed after shipment of the printers to MCC.

3. EO-4906. EO received on 5 February, and EI No. 1 released 17 February. The APL was released 23 February. Procurement is in process.
- B. Specific TO: TO-3961, High Speed Printer Survey. Procurement specifications and work statements were released 18 February. Other effort is complete.

3.3 SUPPORT SYSTEMS

3.3.1 General TO-5110, Simulation Programming

3.3.1.1 Progress During Quarter

- A. Sim ALDS. At NASA direction, the conversion of Sim ALDS to U1218 has been terminated and work has been redirected to the U418. The reconfiguration to Mission H-3 has been completed and the GO-tape has been released to operations.
- B. CST Study. The Simulation Systems Programming Section is participating in a study to determine the feasibility of using a computer to drive the cockpit simulator trainer. If feasible, we are also to recommend the size and type of computer need to accomplish this task. To date, a preliminary set of math models have been generated and study of these equations is underway. Concurrently, a search is being made to determine if there is within NASA a surplus computer suitable for this application.

Another Computer

3.3.1.2 Problem Areas

No major problems exist.

3.3.1.3 Plans for Next Quarter

- A. Sim ALDS. Support for this program shall be provided as requested by NASA.
- B. CST Study. It is expected that this study will be completed in the next quarter.
- C. Pre-Sim. Work has resumed on the Pre-Sim Program. It seems likely that this test system can be completed in the second quarter this year.

3.3.2 General TO-5111, Simulation Programming (DIP)

3.3.2.1 Progress During Quarter

- A. DIP Test 1. With termination of the Sim ALDS Program conversion to the U1218, the requirement for this program has been deleted.

- B. DIP Test 4. A new request to validate the GSSC TLM output formatting has been received. The principal difference between this requirement and the old DIP 4 is the new program will be used to validate the 36 Kbs simulation telemetry format, whereas the old was used to check the 40.8 Kbs ALDS output of GSSC. To date, the problem definition is nearing completion and the interface specifications are being determined.
- C. DIP Test 6. The requirement for DIP 6 to limit-sense both live data and data from a log tape has been completed. Work is currently underway to provide 1004 printer plots from log tape data.
- D. DIP Test 8. The test support by DIP Test 8 has proven to be most valuable to GSSC personnel. The Simulation Systems Programming Section is currently implementing a new automatic sequence to step from one phase of Test 8 to another. This will greatly speed up the operation of Test 8, thus cutting down on the testing time required and resulting in a cost savings to the Government.
- E. KAST. Several new testing requirements previously discussed under Test 8 have been broken out and a new test program has been defined. The first phase of this new test shall be to validate the GSSC CSM telemetry sensor faults. Design of this test has been completed and coding is well underway.
- F. SALT. Requirement has been received to prepare a program that will test the CMD responses of the AMS and LMS models in the GSSC. It is expected that the first actual programming requirement will be prepared by 1 April 1970.

3.3.2.2 Problem Areas

No major problems exist.

3.3.2.3 Plans for Next Quarter

- A. DIP Test 4. It is expected that the requirement for this test will be finalized, the design completed, and coding well underway in the next quarter.

- B. DIP Test 6. The plot capability will be completed next quarter.
- C. DIP Test 8. The automatic sequence will be completed next quarter.
- D. KAST. The coding for the sensor faults test will be completed and debug of the program nearly completed in the next quarter.
- E. SALT. If the first program requirement was received on 1 April as expected, the design of this test can be completed and the coding well along by the end of the second quarter.

3.3.3 General TO-5120, SSB Requirement Generation

3.3.3.1 Progress During Quarter

- A. Personnel were relocated from on-site to the Nova Bldg.
- B. GSSC requirement for Mission H-3 was completed.
- C. The DIP programs have taken on greater emphasis and new programs have been developed or implemented for the SLV flight crew trainers and TLM.
- D. Documentation for Mission H-3 has been completed; publication of SSB-400 and SSB-404 is due the second quarter.
- E. Requirement generation for Skylab has been started and a blueline of SSB-600 (600 series will represent GSSC Skylab requirements) has been distributed. A decision not to publish a blueline of SSB-605 (GSSC D/TV displays) prior to the preliminary requirement date in August was made and will insure a better document. Greater emphasis is being placed on detailed documentation of Skylab requirements over Apollo requirements.

3.3.3.2 Problem Areas

No major problems exist.

3.3.3.3 Plans for Next Quarter

- A. Commence effort on requirements for Apollo Mission H-4.
- B. Continue with requirements for Skylab with a schedule of delivery to the contractor in August 1970.
- C. Continue with the development and implementation of DIP programs for testing.
- D. Continue with checkout and testing of Mission H-3.
- E. Publish necessary updates to SSB-400, SSB-404 and SSB-300.

3.3.4 General TO-5130, Support Systems Programming.

3.3.4.1 Progress During Quarter

- A. Debug was completed on the CADFISS generation program.
- B. Two CADFISS tapes (Mission H-1) were generated and delivered to NASA.
- C. One static CISS tape (Mission H-1) was generated and delivered to NASA.
- D. A dynamic history CISS tape and a dynamic update CISS tape (Mission H-1) were generated and delivered to NASA.
- E. The confidence tape script program was modified, checked out, and special scripts of the Mission H-2 data were generated and delivered to NASA.
- F. An updated version of the Mission H-1 CADFISS data tape was generated and delivered to NASA.
- G. An updated version of the Mission H-1 CISS static data tape to incorporate requirement changes was generated and delivered to NASA.
- H. A CISS dynamic data tape with validation report was generated and delivered to NASA.

- I. Program documentation was completed in rough draft form for three of the six programs in the CISS ground script system.
- J. Revision 4, Mission H-2 CISS static data tape was generated and delivered to NASA.
- K. Revision 4, Mission H-2 CADFISS data tape was generated and delivered to NASA.
- L. Discrepancies in the CISS dynamic program were corrected and the program is currently being updated for Revision 4, Mission H-2.
- M. Modification of AGFRMT and FMINIT have been completed and building of the Mission H-3 confidence tape has started.

3.3.4.2 Problem Areas

No major problems exist.

3.3.4.3 Plans for Next Quarter

- A. Delivery of an Mission H-2 CISS dynamic tape.
- B. Delivery of the Mission H-3 CISS static, CADFISS and dynamic data tapes.
- C. Delivery of the Mission H-3 mission confidence tapes.
- D. Complete program documentation for the CISS ground script programs.

3.3.5 TO-5132, ALSEP Sim Support Model

3.3.5.1 Progress During Quarter

- A. ALSEP III Program was designed, coded, validated and delivered on time.

- B. Supported three ALSEP III lunar surface simulations including those for the heat flow experiment on 4 March, cold cathode cage experiment on 11 March, and charged particle lunar environment experiment on 19 March.
- C. Program document for the CPLEE and HFE is in progress.
- D. Program documentation for the CCGE experiment was completed.
- E. Design of ALSEP IV began.

3.3.5.2 Problem Areas

No major problems exist.

3.3.5.3 Plans for Next Quarter

- A. Support all ALSEP III simulations.
- B. Complete ALSEP III documentation.
- C. Complete design for ALSEP IV.
- D. Build ALSEP IV math model system.
- E. Generate ALSEP IV documentation.

3.3.6 TO-5140, Systems Test Development and Operations

3.3.6.1 Progress During Quarter

- A. Generated the following DGEN data base tapes and/or updated, validated and delivered them to NASA:
 - Mission H-1, Revision 3, CCATS
 - Mission H-2, Revisions 2, 3, 4, and 4A, CADFISS
 - Mission H-3, Revision 1, CCATS
 - Mission H-2, Revision 5, Command/Communication

- B. Updated Section 5 of SSB-201 to reflect the latest changes in the CCATS Version IV command requirements.
- C. Provided approximately 380 hours of DGEN support during the quarter.
- D. Reviewed the CISS off-line programs for NASA and participated with NASA in the running of each program.
- E. Completed a review of the preliminary *CISS Operations Manual* and submitted recommended changes to NASA.
- F. Began supporting CISS computer runs for familiarization with the CISS system.

3.3.6.2 Problem Areas

No major problems exist.

3.3.6.3 Plans for Next Quarter

- A. Update DGEN data bases as required by NASA.
- B. Build Mission H-3 DGEN command tape.
- C. Continue to provide DGEN operational support as required by computer schedules.
- D. Continue to become familiar with the CISS operations and CISS off-line programs and provide operational support as required.

3.3.7 TO-5150, TO-5160 and TO-5170, GSSC/APCU/SSP Programming Specifications

- A. GSSC Programming Specifications, TO-5150
 - 1. SSB-404, Rev. A, GSSC D/TV Displays, was sent to review 26 March. Publication is scheduled for the second week in April.

2. The first draft of initial inputs for SSB-600, Skylab General Requirements, was sent to review 17 March.
 3. First inputs for SSB-604 were received. First review is scheduled for the first week in April.
 4. Rev. B of SSB-400, GSSC General Requirements, was delivered 17 February.
 5. Rev. A, Change 1 of SSB-402, GSSC LM Model, was delivered 16 February.
 6. An errata listing for Rev. 1, Change 1 to SSB-403, GSSC CSM Model, was delivered 7 January.
- B. APCU Programming Specifications, TO-5170. First inputs for Rev. B of SSB-300, APCU Programming Specifications, were received 19 March. Review is presently scheduled for the fourth week of April.
- C. SSB Programming Specifications, TO-5170
1. SSB-200, Change 9, containing Section 12, ALSEP Simulation Program, was sent to review 17 March. Publication is scheduled for the second week in April.
 2. Inputs for Change 3 to SSB-201 were received 10 March. Review is scheduled for March 31. Publication is scheduled for the second week in April.
 3. The PRE-SIM and ALERT packages of SSB-203, Vol. 3., User's Manual, were returned from review and are undergoing final preparation for publication. Publication is scheduled for the third week in April.
 4. SSB-200, Change 8, containing DIP 2 and DIP 6, was delivered 26 February.
 5. Section 4, ALERT Program, of SSB-203, Vol. 1, Hardware Checkout Program Specifications, was delivered.
 6. COST and PRE-SIM packages of SSB-203, Vol. 1, were delivered 15 January.

3.3.8 General TO-5180, APCU

3.3.8.1 Progress During Quarter

- A. APCU. Completed Mission H-2 System testing and delivered GO-tapes 291 and 293 which are currently being used to support simulations. Completed Mission H-3 initialization and generated GO-tapes 151 and 152. Delivered Mission H-2 documentation updates (PHO-TR257) and Mission H-2 appendix to the *GACC Handbook*. Implemented 31 new or changes to requirements in the Mission H-2 program package during the quarter. Implemented 35 new or changes to requirements in the Mission H-3 program package.
- B. DIP 2 (APCU Display Test). Development continuing on data integrity test.
- C. DIP 3 (APCU Telemetry Test). Completed Mission H-3 initialization. Completed Format 30 and USB status word sub-tests. Implemented EMOD simulator in the Mission H-2 program and updated the single/sector wd dump sub-test in response to ACF 918.
- D. DIP 5 (APCU Command Test). Completed Mission H-4 initialization. Implemented NON-VAL error code sub-test. Completed the documentation of the DIP 5 Executive (used by DIP 2, DIP 3, ALSEP).
- E. Confidence Tape Validation. Completed implementation of the computer word tests (CMC, LGC, AGS, and LVDC) using the script tape.

3.3.8.2 Problem Areas

No major problems exist.

3.3.8.3 Plans for Next Quarter

- A. APCU. Mission H-3 test plan and test procedures will be delivered to NASA. Subsystem and system testing of the Mission H-3 program package will be completed. Implementation

of the APCU Event History processor and updating of support programs will continue. Mission H-4 initialization effort will start.

- B. DIP 2. Development of data integrity and special processing tests will continue.
- C. DIP 3. Support of APCU Mission H-3 Telemetry Unit and subsystem testing will continue. Development of additional telemetry tests, covered by SCF 374, will continue.
- D. DIP 5. Support of APCU Mission H-3 Command Unit and subsystem testing will continue. The Mode I test is scheduled to be completed along with additional tests necessitated by changes in APCU requirements.
- E. Confidence Tape Validation. Changes to clock routines as specified by SCF's will be implemented. Validation of Mission H-3 confidence tapes will be completed.

3.3.9 General TO-5200, ASCATS System Engineering

A. General

- 1. CAI Test Bed. This effort is being held in abeyance pending completion of EO's and subsequent manpower available.
- 2. Capabilities Study. Work on the capabilities study was temporarily suspended due to higher priority items.
- 3. M&O Support. Approximately 100 hours of engineering effort were provided to the M&O team in support of ASCATS hardware.

- B. Specific TO: TO-5202, Saturn Workshop Cockpit Simulation Trainer. This TO to conduct a Saturn Workshop Cockpit Simulation Trainer Study was received on 5 February 1970. This effort was completed prior to April 1st. A computer sizing study will be appended to the cost data.

C. Specific EO's

1. EO-6202, Building 5 Trainer. PHO engineering efforts have been completed. Currently awaiting completion of Link efforts in order to requalify system.
2. EO-6203, FSMR. This EO was placed on hold by NASA on 30 January 1970. A meeting with NASA concerning EO turn-on and task realignment was conducted on 19 February.
3. EO-6207, Equipment Removal from Building 422. Part-time work is continuing on the cleanup effort.
4. EO-6208, GACC II. This EO, to provide an additional GSSC-APCU control and monitor console for ASCATS, was received on 5 February 1970. All engineering instructions have been written and released. A conceptual design review was convened and engineering efforts have commenced. All aspects of this EO are on schedule.
5. EO-6210, Data Routing Cabinet. This EO to expand and reconfigure the ASCATS data routing cabinet was received on 5 February. All engineering instructions have been written and released. Work is underway on fabrication drawings and wire lists are 80 percent complete.
6. EO-6213, Ribbon Cable Strain Relief for SIM CASTS. This EO was cancelled.
7. EO-6215, Support Brackets for TMG/TMR Control Panel. This EO effort is complete.
8. EO-6216, MDD Modifications. This EO, to make minor modifications to the MDD, was received on 20 February. Initial coordination efforts have commenced.
9. EO-6217, Trygon Power Supply Modification. EI No. 1 has been written and released. Preliminary efforts are underway.
10. EWO-6214, Astrodata Power Supply Modification. The EWO has been completed.
11. EWO-6220, AECL Wiring Modifications. This EWO was completed on-site.

3.4 INFORMATION SYSTEMS DIVISION/TELECOMMUNICATIONS SYSTEMS DIVISION

3.4.1 TO-7702, Analysis of Communications System Capabilities for MCC Communication Support

3.4.1.1 Progress During Quarter

- A. Engineering Support for Space Communications. The design of subcarrier filters for use in the Apex system was completed. Impedance matching devices were designed for use with the Apex subcarrier eliminator. The output spectrum of the Apex subcarrier extractor was analyzed. Technical assistance was provided, using the Apollo color television system during the test and evaluation of the Apex system. The operation of the Philco television video delta modulator was evaluated. Hardware components were specified for a television video digital delay line, including layout of the hardware components.
- B. Space Shuttle-to-Ground Terminal (via Intelsat IV) Communications System Design and Implementation Characteristics. The investigation of block diagrams for the digital C-Band up-data demultiplexer/decoder was accomplished. The reliability of STS C-Band communications was evaluated for use in reliability studies of the STS communication system. Block diagrams of the C-Band communications system were prepared and delivered to NASA.
- C. S-Band Test Predictions. All of the final calibration and operational predictions have been verified. The data plots have been assembled, checked, and sent to publications. A rough draft of the text of the document has been written and reviewed. Additions and changes are currently being made to the text. Working copies of the final calibration LM television predictions have been delivered to NASA (EE-8). The LM television final calibration test predictions were completed with the addition of the missing information. Certain predictions have been expanded so that more data could be obtained for expanded scales on graphs. The final test prediction document is currently in the final engineering review cycle.

- D. Lunar Far-Side Communications. The technical memorandum, "Lunar Far-Side Communications System Using Libration Point Relay Satellites," was delivered to NASA in March. This report extended the analysis previously accomplished under this action document to include additional factors required by NASA. A separate memorandum compared libration point satellites and orbital satellites. The two technical memorandums concerning libration point satellites for far-side communications are currently being combined into a single report for formal publication.
- E. ALEM Subcarrier Filter Design. This task was initiated on 7 January 1970 to design subcarrier bandpass filters for the ALEM test set. The filter design was completed in January, construction was completed in February and engineering evaluation was completed in March, completing this project.
- F. Variable Slope Delta Modulator. This project was initiated on 15 January to develop a variable slope delta modulator for laboratory test and evaluation. A study plan and schedule were prepared. The study phase of the project was completed on schedule and specifications for the modulator were prepared. Analysis of the operating characteristics has been completed, using computer programs to study the various step functions in the slope. Circuit design is currently underway.
- G. Video Delay Line Using Digital Circuitry. This task was initiated on 2 March to develop a rough circuitry layout and to provide a hardware list for a video delay line. A list of the basic digital circuitry was provided. This project was completed on 6 March, and the AD was closed out on 12 March.

3.4.1.2 Problem Areas

No major problems exist.

3.4.1.3 Plans for Next Month

- A. Initiate study of the space shuttle communications system.
- B. Complete variable slope delta modulator.

3.4.2 TO-7706, System Engineering and Evaluation

3.4.2.1 Progress During Quarter

- A. PAM Synchronization Study. A transfer function for the Butterworth filter in the PAM decommutator was located and the pulse responses for various bandwidths were calculated and are presently being plotted. The pulse response of the RC filter in the Stellarmetrics PAM decommutator was calculated for various bandwidths. Stellarmetrics was contacted concerning various test results on the data formatter. Information was obtained concerning testing of synchronization acquisition, synchronization dropout and leading-edge conditions. Continued research into preparing a math model to describe the synchronization problem, and initiated an effort to coordinate the relationship between the controllable functions in the synchronization scheme and the interactive of these controls in Stellarmetrics data formatter. Initial test results and photographs were received from the recommended test plan. These results are currently under analysis.
- B. FM Threshold Communication System Study. A revised outline of this study was prepared and submitted to NASA in conjunction with new test procedures to minimize the period of testing. The series of tests were prepared, reducing the number of tests necessary to verify theoretical results of the math model under consideration. These tests have been submitted to NASA for approval and the required laboratory work. Efforts are continuing toward verifying, through theoretical means, the validity of the existing equations in the math model.
- C. Voice Channel Specification. The engineering analysis on this project has been completed. Both the automatic and

manual techniques of specifying voice channel characteristics have been examined. The final report on this project was delivered to NASA for review on 5 March, and the revisions suggested by NASA have been incorporated into the document.

- D. Advanced Intercom System Study. Analysis of digital and analog techniques for voice data transfer on the space base continued. Evaluation of the digital communication techniques using different conversion schemes and their application to space environment were investigated. A preliminary block diagram of the system has been prepared and a state-of-the-art review of techniques to implement this diagram is currently underway.
- E. Apollo Communications Handbook Update. The update, which included the characteristics of the lunar module color television, has been completed and delivered to NASA.

3.4.2.2 Problem Areas

No major problems exist.

3.4.2.3 Plans for Next Quarter

- A. Continue investigations into testing techniques and models for voice channel specifications.
- B. Continue development of the space base intercom system.

3.4.3 TO-7607B, Conceptual Design and Tradeoff Studies for MSC System Development

3.4.3.1 Progress During Quarter

- A. Space Base Command Center. Space base command center display/control design guidelines were completed in preliminary form and delivered to NASA for review on 14 January 1970. The report contains the results of an operational analysis on the space base mission and the space base relationship to other space activities. It specifically centers on the requirements for display and

control of the space base systems and external vehicles from the space base command center. A formal presentation was given to the NASA concerning the report contents. The report has been upgraded to include NASA comments and will be published next quarter.

- B. Space Shuttle System Evaluator. The design of the space shuttle display/control system evaluator has been initiated. Task objectives, operating requirements and constraints, and operating characteristics of the system have been prepared. Design engineering has started based on tentative approval by NASA of the requirements and characteristics.
- C. Space Shuttle Cockpit Concept. An evaluation has been initiated to select the best features of all the previous space shuttle concepts and carry the analysis to a depth suitable for implementation in the systems evaluator. This project has been scheduled for completion in April.
- D. Space Shuttle Mission Timeline. An analysis of the space shuttle mission has been initiated to determine a detailed mission timeline for developing display and control requirements. This analysis will develop the displays and control commands to a level suitable for programming. It will be used as a pilot timeline in the system evaluator.

3.4.3.2 Travel

E. Miller attended the Space Shuttle Conference at Patrick AFB, Florida, in February. A formal report was given to NASA.

3.4.3.3 Problem Areas

No major problems exist.

3.4.3.4 Plans for Next Quarter

- A. Implement the space shuttle system evaluator.
- B. Develop the space shuttle cockpit concept.
- C. Develop the space shuttle mission timeline.

3.4.4 TO-7709, Raster Converter/DTDS Integration Project

Final efforts being negotiated with the NASA task monitor.

3.5 SCHEDULE III EO's

3.5.1 General EO's, FSD General Tasks

- A. EO-1846. The balance of the hardware to complete this modification is to be shipped to the site 6 April; the scheduled installation completion date is 8 April 1970.
- B. EO-1849. P-Tube system II was implemented on 13 March. System III will be implemented after H-2 Mission.
- C. EO-1861. NASA has instructed to "hold all effort."

3.5.2 Display Engineering

A. Specific EO's

- 1. EO-3050, Ignitor Modifications. All 40 units have been completed. Final documentation is in progress. Testing was completed on 3 March.
- 2. EO-3067, Refurbishment of GFE D/TV Equipment. EI No. 1 was released on 6 February. The equipment was temporarily installed in the SEF for modification and engineering checkout prior to MOW installation under EO-4028. This EO was terminated by NASA.
- 3. EO-3401, DTE Procurement. This EO was terminated by NASA on 2 March. All effort was transferred to EO-4401.
- 4. EO-3402, Video Switch Matrix Buffer Multiplexer. The VSMBM was shipped and installed on 23 October 1969. Installation testing was completed on 5 December. This EO was terminated by NASA on 2 March.

5. EO-3502, Capability for Timeline Switches for Both Floors of Hardcopy. Redesign due to EWO-1543. EI No. 4 generated to accommodate EWO-1543. Installation completed. Second-floor test completed 4 February. Third-floor final test completed 26 March. Final documentation is in progress.

B. Other Display EO's. None.

3.5.3 Timing and Control Engineering

No EO's.

3.5.4 Telemetry Engineering

No EO's.

3.5.5 Communications Engineering

- A. Specific EO: EO-3727, Installation and Documentation of CCS Standard Plug-In Cards. This EO directs installation of standard cards in all CCS card slots, documentation of installed/vacant status of each slot, and generation of a comprehensive list of module assignments. The first two items were accomplished; securing the assignment printouts from the Configuration Control group proved difficult. On 13 March, a set of printouts were transmitted to PHO and NASA Engineering. The printouts were rejected by NASA, with directions to PHO Engineering to resolve the problem. Subsequent meetings with PHO Configuration Control and with NASA FSD are expected to resolve the problem areas.

B. Other Communications EO's. None.

3.5.6 CCATS Hardware Engineering

- A. Specific EO: EO-3968. The pre-QT was completed 29 December 1969. All documentation is being updated to reflect as delivered hardware. EI No. 6 effort was completed on 3 March. EI No. 8 for the tape load sequence and punch warning decals was expected to be completed by

27 March. A TPS is being prepared with installation and acceptance anticipated to be completed prior to Mission H-2. EI No. 9, the 15 etched boards for the wide-band modem (PBT) terminator were completed 20 February. The assembly of the mapping logic board was completed 10 March and functionally tested on 22 March. The modification of the 35 high-speed modem terminator cards will not be performed until after Mission H-2. Work is being done to develop a procedure by which these cards can be modified and accepted.

A total of 65 PCB's have been tested and accepted to date. Engineering has received 66 PCB's for testing. The remaining one PCB is expected to be tested and accepted prior to Mission H-2, based on being able to obtain adequate SCU downtime between now and by 11 April. It is anticipated that three hours of test time will be required.

The second air handler was turned off 20 February to evaluate operations of the SCU with only a single air handler supplying refrigerated under-the-floor air. The SCU performed normally under these conditions. Cabinet exhaust temperature was measured and did not exceed 90°F.

3.5.7 ASCATS System Engineering

No EO's.

3.6 SCHEDULE II EO'S

All Schedule II EO effort was completed. Thirteen of these EO's require manual revisions. These revisions are being accomplished under Schedule III, Option 1 MEO's. The last remaining Schedule II open account was for Manual PHO-EM272. As this manual was delivered in March, and since further effort to sell-off the 13 remaining EO's is authorized in Option 1, this paragraph (Paragraph 3.6) will no longer be reported.

SECTION 4

OPERATIONAL SUPPORT

4.1 FLIGHT CONTROL DEPARTMENT

4.1.1 Progress During Quarter

4.1.1.1 Mission Operations Unit

- A. Developed and submitted MCC Integrated Command System Proposal.
- B. Provided an SOR to modify the command switch modules.
- C. Provided support for the Mission H-2 simulations and pad testing.
- D. Reviewed and submitted comments to the CSM and LM crew checklists for Mission H-2, and attended crew checklist meeting with FCSD to finalize AOS and LOS procedures for the LM steerable antenna.
- E. Reviewed and submitted comments to a memorandum from Systems Engineering Division entitled "Investigating the Feasibility of RF Transmission Through the Moon."
- F. Provided support for math model and CMS/LMS simulations for Mission H-2.
- G. Provided inputs to the Mission H-2 Communications Plan and the Instrumentation Support Plan.
- H. Participated in the Operation/Facilities Working Group meeting for Skylab.
- I. Completed a matrix of communications failures versus mission effects for Skylab.
- J. Submitted a draft of the proposed communications section of the *Saturn Workshop Handbook*.

- K. Participated in cockpit simulation training for the CSM and LM.

4.1.1.2 Experiments Systems Unit

- A. Continued support of the ALSEP 1 package on the lunar surface as real-time flight controllers.
- B. Participated in simulations for the upcoming Mission H-2 as ALSEP 3 flight controllers.
- C. Participated in walk-through of ALSEP 3 deployments with prime crew and generated inputs to the lunar surface procedures handbook.
- D. Completed a layout sketch on the Charged Particle Lunar Environment Experiment for updating of the *ALSEP 3 Handbook*.
- E. Completed work on meter scales and recover overlays for flight control of the ALSEP 3 package.
- F. Completed preparation of a display scheme for recovery of digital history for the ALSEP 4 mission, and submitted inputs for preparation of an ALSEP confidence tape applicable to ALSEP 4.
- G. Prepared an update to the data pack to integrate the Space Particle Analysis Network (SPAN) flight control effort with the ALSEP flight control effort.
- H. Completed a review of the telemetry and data handling functions of CSM No. 112 in preparation for a critical design review.
- I. Completed an update to the Mission J-1 mission experiments briefing package.
- J. Completed display requirements for Experiments S082A (Spectroheliograph) and S082B (Ultra Violet Spectrometer).

- K. Submitted generic requirements for the sub-satellite.
- L. Completed work on a preliminary document covering habitability of the Saturn Workshop.

4.1.1.3 CSM Systems Unit

- A. Participated in Mission H-1 RCS thruster activity study in lunar orbit.
- B. Participated in Mission H-2 simulations, testing and team meetings.
- C. Manned console positions during CDDT and FRT.
- D. Reviewed Mission H-2 crew checklists and flight data file and submitted comments for approval; reviewed mission rules and malfunction procedures.
- E. Reviewed and updated ECS and propulsion Olivetti programs for Mission H-2.
- F. Worked on Mission H-3 cryo redlines to support extended lunar stay mission.
- G. Submitted changes to the Mission H-2 data pack.
- H. Worked on orbital workshop special processing requirement, and prepared ECS drawings for orbital workshop; attended several Skylab flight software meetings.
- I. Provided inputs to a detailed test objective (DTO) using gravity gradient stabilization for the CSM in lunar orbit.
- J. Participated in development of a special task for automated techniques for spacecraft monitoring.

4.1.1.4 LM Systems Unit

- A. Analyzed Mission H-1 data to determine validity of lunar gravity calculations and worked on Mission H-1 "central" post-mission report.

- B. Monitored SESL vacuum chamber runs for Mission H-2; worked on data pack for Mission H-2; reviewed Mission H-2 rules, malfunction procedures, and crew checklists, and participated in Mission H-2 simulations and team meetings.
- C. Participated in preparation of new procedures for balance couple switch during manual or AGS ascent.
- D. Maintained LM Systems Branch calibration and instrumentation documents.
- E. Wrote and revised systems briefs on thermoelectric and thermoionic power conversion systems for Apollo console handbook.
- F. Prepared battery management candidate plans for LM-10.
- G. Wrote a note of interest on the capability of the LM ascent engine with the loss of 4CB37 circuit breakers.
- H. Wrote a note of interest and systems brief on calculation of PIPA bias on the lunar surface.
- I. Wrote an Olivetti program to support lunar surface PIPA bias calculation.
- J. Coordinated lunar gravity calculations with math physics branch, MPAD.
- K. Prepared briefs for Space Station console handbook.
- L. Participated in LM control electronics systems (CES) software meeting, and revised *LM System Handbook* drawings for CES.

4.1.1.5 Simulation Unit

- A. Prepared and completed a total of 93 simulation scripts in support of Mission H-2 simulations.
- B. Participated in 10 math model and 22 flight crew trainer Mission H-2 simulations.

- C. Continued development of Skylab Orbital Workshop Cockpit Trainer system requirements. Panel support drawings were completed for both the STS and ATM. Draft of telemetry simulation requirements was completed.
- D. Continued maintenance operations on both CSM and LM cockpit trainers. Installation and checkout of CSM FDAI and operational handcontroller was completed. Completed implementation of LM CST "S" Band receiver fault circuitry, and installed additional slide projector and controls for DSKY in LM CST.
- E. Conducted CSM and LM CST training exercises in support of Mission H-2 flight controllers.
- F. Continued updating CST scripts and developed new training aids in support of future CST exercises.
- G. Initiated development of TMC console procedures.
- H. Submitted requirements for update to APCU Mission H-3 Data Processing and submitted simulation ATM study of UHF command and signal strength for review.
- I. Completed Active Seismic Experiment simulation requirements.
- J. Submitted three corrections to RTCC Simulation Calibration Tables.
- K. Submitted Change 1 to APCU/GSSC Simulation Requirements.
- L. Submitted keyset reconfiguration changes for simulations.
- M. Submitted several changes to simulation network requirements for both command and ground track programs.
- N. Prepared and defined procedures to be used to record and process erasable memory octal dump during simulations.
- O. Initiated definition of new program requirements for the APCU in the areas of remote site Change of Stream 1/Change of Stream 4 routines, as well as site status words for Mission H-3.

- P. Prepared and conducted a Cap Comm briefing to Mission H-2 Cap Comms on SLV, CSM, LM and Flight Dynamics D/TV displays.

Conducted briefing and MCC tour for 33 members of the Skylab Workshop Simulator Conference.

4.1.1.6 Requirements Unit

- A. Participated in Mission H-2 and ALSEP 3 validation tests.
- B. Provided updates to RTCC for Mission H-2 operational calibration tape.
- C. Participated in Mission H-2 CDDT's.
- D. Completed Mission H-2 data flow scripts for the SLV, CSM and LM vehicles.
- E. Calculated the LM and CSM gimbal angle constants and curves required for the RTCC for Mission H-2.
- F. Constructed scripts for the Mission H-2 III fuel and LOX flow rates and fuel and LOX pump speeds.
- G. Supported the SLV redundancy test and FRT with operational calibration curve data.
- H. Assisted in a study which investigated the utilization of Intelsat IV communications satellite as the communications link between the space station/base and ground facilities.
- I. Submitted a proposal to reduce workload in reviewing and updating the Operational Calibration Curves.
- J. Completed draft of Network Support for the Skylab Statement of Requirements.
- K. Submitted SR-729-1 and SR-737; developing SR-735. Submitted Advance Planning Action Item Memo entitled "Apollo/Apollo Lunar Experiment Module Issue No. 3 (Space Tracking and Data Acquisition Network/Deep Space Network Capabilities Analysis)." Evaluated Deep Space Nav stations and NASCOM/MCC interface for mission support planning.

L. Completed and delivered the following:

1. SLV Timeline and updates; *Directory of Standard Nomenclature*, with Rev. A, Change 3; and *Flight Control Operations Handbook*.
- 2.. Mission Rules Rationale
3. *ALSEP Console Handbook* and ALSEP Systems Mission Rule Document.
4. Initial run of Flight Operations Plan.
5. Final Mission Rules
6. Second run of the *LM Console Handbook*

M. Reviewed EU computer printout from FSD of LVDC data programmed on the AC tape.

N. Attended the Flight Operation Plan meeting for Missions H and J.

O. Drafted a communications plan for the projected Space Station in preparation for the submittal of the ISR (Information Systems Requirements) document.

4.1.1.7 Travel

- A. H. Straw traveled to Huntsville, Alabama to attend a preliminary design review for Experiment M-507.
- B. H. Straw traveled to Martin Corp. in Denver to attend meetings relating to experiments slated for the Skylab mission.
- C. F. DiGenova went to Huntsville, Alabama to participate in a review of Skylab software.
- D. F. DiGenova went to Teterboro, New Jersey, to participate in a Bendix briefing on the Skylab control moment gyros (CMG).

- E. J. Conner went to MSFC to discuss Skylab communications systems on the ATM and AM.
- F. L. VandeZande traveled to JPL facilities at Pasadena, California to participate in the critical design review of a Skylab experiment, the gamma ray spectrometer.
- G. P. MacGregor traveled to McDonnell-Douglas facilities at Los Angeles, California in connection with a task concerning the Saturn Workshop habitability review.
- H. E. Warden traveled to Ball Brothers at Boulder, Colorado in connection with a task on the ATM Experiment S082A and S082B (Solar Spectroheliograph).
- I. G. Conway traveled to Los Angeles to Air Research relative to Orbital Workshop and CSM ECS equipment.
- J. W. Weber, D. Siglinger, E. Chmielewski and E. Faupell went to KSC at various times during the quarter in support of CMS Mission H-2 simulations.
- K. P. Dasch, H. Stenfors, and A. Hughes went to KSC at various times during the quarter in support of LMS Mission H-2 simulations.
- L. D. J. McDonald went to Bendix Corporation, Ann Arbor, Michigan, to attend a failure analysis meeting on the ALSEP 1 Transmitter "A".
- M. J. Moser went to Cape Kennedy to participate in a practice deployment of the ALSEP 3 package.
- N. G. Asher and B. Brabant made a trip to TRW at Redondo Beach, California in connection with a Lunar Sub-Satellite task.
- O. B. Brabant traveled to North American Aviation Facility at Downey, California to participate in a Critical Design Review on Spacecraft number 112.

4.1.2 Problem Areas

No major problems exist.

4.1.3 Plans for Next Quarter

4.1.3.1 Mission Operations Unit

- A. Support Mission H-2.
- B. Continue effort and the command history requirements for the Skylab program.
- C. Continue effort on communications overview drawing for Skylab.

4.1.3.2 Experiments Systems Unit

- A. Support of Mission H-2 as ALSEP and space particle analysis real-time flight controllers.
- B. Continue work on the *SWS Systems Handbook*.
- C. Continue work on the *ATM Systems Handbook*.
- D. Prepare briefing data on the Skylab data system.

4.1.3.3 CSM and LM Systems Unit

- A. Continue preparation for Mission H-2.
- B. Man consoles during Mission H-2.
- C. Continue preparation of requirements for RTCC processing.
- D. Continue work on Skylab.
- E. Continue reviewing battery management for LM-10.
- F. Continue maintaining LM calibration and instrumentation documentation.

4.1.3.4 Simulation Unit

- A. Man and operate assigned simulation consoles in support of all scheduled Mission H-2 simulations and checkouts.
- B. Monitor Mission H-2.
- C. Continue to conduct training exercises on both CM and LM cockpit trainers.
- D. Continue development of CST requirements in support of Skylab Orbital Workshop CST's.
- E. Continue development of simulation system requirements.
- F. Continue maintenance and upgrading of LM and CSM CST's.
- G. Initiate development of new CST training exercises.
- H. Continue development of simulation console procedures.

4.1.3.5 Requirements Unit

- A. Participate in all tests that are Flight Control-supported.
- B. Provide revisions and baseline documentation as required.
- C. Review MOCR/SSR displays as required.
- D. Continue development of Statement of Requirements.

4.2 DISPLAY FORMAT DEVELOPMENT

4.2.1 Progress During Quarter

4.2.1.1 Mission Support

- A. Mission H-2. Mission support is progressing smoothly.
- B. D/TV. Initiated production on Mission H-2 remake package for M&O mission support. Approximately 7,000 slides are needed for this requirement. Slide production on Mission H-3 requirements has been temporarily halted in order to satisfy Mission H-2 slide requirements. Resumption of Mission H-3 slide production should have resumed on or before 1 April 1970.
- C. Publications. These included PHO-TR170B, Vol. I, Revisions 46 and 47; PHO-TR147, Revision C, Change 3, which is in progress, and PHO-TR407B, Vol. I, Revision 6.
- D. ALSEP
 - ALSEP I - 85 percent complete
 - EASEP II - Complete
 - ALSEP III - 50 percent complete
 - ALSEP IV - 80 percent complete
- E. DSCOP/Gerber
 1. All D/TV mattes are now being produced on the Gerber plotter.
 2. A backup source for Gerber plotter services, Systematic Design Inc. of Dallas, was qualified.
 3. A revolving door and safe lights have been installed in Building 225, greatly improving the Gerber Plotter area.

4. New production control procedures incorporated to monitor DSCOP/Gerber production flow are proving much more effective than previous procedures.

F. DRAFT

1. A limited amount of DRAFT familiarization training for display format engineers has been accomplished.
2. An operational version of the DRAFT program has been completed and will be turned over to the display format engineers next month.
3. Work began 7 March on transferring display data on the DSCOP file to the DRAFT System disc file. This task is very nearly complete.
4. DRAFT keyboard configuration has been designed and submitted to PHO engineering for incorporation in DRAFT on 360/75.
5. A magnetic tape containing test display data was delivered to NASA/IBM for use in DTE checkout.
6. A magnetic tape containing all of the Mission H-3 displays was delivered to NASA/IBM for use in RTCC program checkout.
7. A set of 300 cards containing display background and command data was delivered to PHO engineering for DTE test purposes.
8. A preliminary interface requirements document for DRAFT on the 360/75 was delivered to PHO engineering.
9. Coordination meetings have been held with NASA/IBM to define new FDS data requirements. The results of these meetings are being documented for integration into DRAFT and PHO-TR147, Revision C, Change 3, cited above.

G. Data Reduction and Analysis for the RTCC D/TV System
(DRIP/DRAP, PEP)

1. Documentation for Mission H-1 is in Technical Publications.
2. The PEP data selection program was completed and checked out.
3. PEP is being used to select data from the IBM log tapes for the launch phases of Mission H-1. This data will be used in checking out PEP data reduction.

H. DTE Display Design Criteria. Display Development Unit personnel are in the process of developing display format design criteria for the MCC "dual-mode operation." Dual mode is defined as that period of time when both the Hazeltine DTE system and the existing D/TV (charactron) system are operating in parallel. A review copy of "dual mode" standards has been distributed to cognizant NASA and PHO personnel.

4.2.1.2 Special Support

- A. Splashdown Display. Artwork has been delivered and slides completed for the Mission H-2 splashdown display. NASA approval of the slides is required before the display is considered complete.
- B. Eidophor Mirror Metalizing. Our goal of achieving an in-house capability to renovate Eidophor mirrors by high-vacuum remetalization has been achieved. Two mirrors were accepted for mission use. A third mirror will be recoated next month.
- C. FAF Slides. A new support request has been received for slides to be used in the new fast-access file display system. This will require limited effort on a probable one-time-only basis.

4.2.1.3 Production Summary

- A. Designed 143 D/TV formats and committed 179 to mylar mattes.
- B. Designed 20 P/P formats and committed six to mylar mattes.
- C. Produced five copies of X-Y plotboard nominals.
- D. Produced 41 DRK subformats.
- E. The following were fabricated this quarter:
 - D/TV slides - 12,560
 - P/P slides - 18
 - DRK reticles - 58
 - Projection readout reticles - 211
 - IEE reticles - 30

4.2.1.4 Travel

R. Hilgeman went to Systematic Design, Inc. in Dallas with a Gerber test tape to qualify a "backup source" for D/TV mylar matte artwork (Gerber mattes).

4.2.2 Problem Areas

- A. Gerber Plotter. The plotter was down 1 thru 7 January, again 15 thru 23 January, for one hour on 29 January, and again 12 thru 16 February, due to lack of readily available spares and low priority of maintenance and repair of the Gerber.
- B. DRAFT System. The system was down from 1 thru 26 January due to a move from Building 440 to Building 15. All disc files, both DSCOP and DRAFT, had to be recreated after the move.

During February and March, 20 to 25 percent of the scheduled time was lost due to IDS presentations, DTDS or 360 failures.

- C. Keypunch. Cards and coding sheets affecting 18 mission-critical displays were lost by the Central Keypunch Facility in Building 12. Considerable time was expended recoding these displays.

4.2.3 Plans for Next Quarter

- A. Complete all planned mission D/TV, P/P, and X-Y plotboard formatting and production requirements. Expect heavy production in Mission H-2 and H-3 D/TV slides.
- B. Publish revisions to PHO-TR170B and PHO-TR407V.
- C. Continue work on Change 3 to PHO-TR147, Rev. C.
- D. Continue training from one to three operators on Gerber 1032 Automatic Drafting Machine and continue the development of operational procedures.
- E. Continue to provide programming requirements for DRAFT II and continue familiarization with DRAFT consoles when the system is up.
- F. Recoat the third eidophor mirror have it accepted for operational use.
- G. Complete conversion of high-vacuum system from liquid nitrogen to a closed refrigerant system. Refrigerant unit was received this month.
- H. Reinitiate efforts to develop an in-house capability to provide projection plotting scribing slides for operational use. This project was scheduled to begin during February but has been delayed due to background slide metalizing and eidophor mirror coatings.

4.3 REAL-TIME COMPUTER COMPLEX PROGRAM

4.3.1 Progress During Quarter

- A. Trajectory Program Requirements. Published Changes 94, 95 and 96 to PHO-TR170A, Volume 2. These changes affect the G-type missions.
- B. Operations Support Plan. Prepared, for NASA publication, Change 6 to MSC Internal Note No. 69-FS-2 (*Mission G Support Plan*).
- C. ALSEP Application Software Requirements. Published Changes 11 and 12 to PHO-TR407A. These changes made minor documentation corrections and added requirements for ALSEP IV.
- D. Apollo Guidance Computer Program Requirements for Skylab Missions. Published Change 3 of PHO-TR442, *CMC Program Requirements*.

4.3.2 Problem Areas

No major problems exist.

4.3.3 Plans for Next Quarter

- A. Command Program Requirements. Continue in coordination, correlation, compilation, documentation and publication of RTCC command program requirements. Specifically, next quarter's work will involve the publication of the Mission H-3 appendix.
- B. Trajectory Requirements. Continue in the coordination, correlation, compilation, documentation and publication of RTCC trajectory program requirements.
- C. Operations Plan. Continue in the coordination, correlation, compilation, documentation and preparation for NASA publication of the RTCC Support Plan. Specifically, next quarter's work will involve Change 7 Mission H-2 of the MSC Internal Note No. 69-FS-2 (G and subsequent missions).

- D. ALSEP Applications Software Requirements. Continue in the coordination, correlation, compilation, documentation and publication of the ALSEP Applications Software Requirements.
- E. Apollo Guidance Computer Program Requirements for Skylab Missions. Continue in the coordination, correlation, compilation, documentation and publication of the Skylab AGC Program Requirements Document. Specifically, next quarter's work will involve the publication of the first major update to the basic document.

4.4 MCC FLIGHT OPERATIONS SCHEDULING

4.4.1 Progress During Quarter

4.4.1.1 Operations Planning

- A. Provided operations coordination and test activity planning for simulations, validations and related prelaunch testing functions required in support of Mission H-2.
- B. Planned and provided operational scheduling required in support of ALSEP I.
- C. Attended test management team meetings and priorities conferences to establish scheduling considerations for upcoming test requirements.
- D. Performed an analysis of CROSS-generated data to evaluate system performance and test scheduling limitations and assisted with the generation of the initial CROSS-produced MCC weekly master schedule.

4.4.1.2 Schedule Formulation

- A. Formulated and updated the ASCATS test schedule on a daily basis.
- B. Coordinated and scheduled PHO, IBM and UNIVAC contractor testing requirements levied on MCC operational facilities.
- C. Completed generation and distribution of weekly MCC Flight Operations Master Test Schedule and daily updates.

4.4.1.3 Statistics and Configurations

- A. Completed the finalized issue of the *MCC Standard Equipment Configuration Guide*. The guide assigns numerical codes to equipment configurations utilized in support of MCC test operations.
- B. Completed the preliminary issue of the MILA station USB and VHF data flow chart. The finalized chart will reflect data chains required to support various MSC prelaunch tests.

- C. Entered 3185 test requests into the CROSS system.
- D. Completed 66 equipment utilization reports which identify deviations from approved scheduled test activities.

4.4.1.4 Schedule Console Operations

- A. Provided daily real-time management of the MCC Flight Operations Master Test Schedule.
- B. Provided technical interface with network controllers and participated in prelaunch test activities conducted for Mission H-2.
- C. Developed a site release plan for use during Mission H-2.
- D. Updated schedule controller procedures for MSFN site status display and site release advisory message generation in support of Mission H-2.
- E. Assisted with the inputting of test request data into the CROSS system.
- F. Updated operational documentation required in support of real-time console activities (DAP Annexes, NOD plus mission and ALSEP supplements, ISP, *MCC Power Configuration Guide*).
- G. Participated in 64 Mission H-2 tests requiring 594 hours of support and 79 ALSEP I tests requiring 439 hours of console support.

4.4.2 Problem Areas

No major problems exist.

4.4.3 Plans For Next Quarter

- A. Continue to provide test coordination, planning and scheduling required in support of Mission H-2.
- B. Attend test management team meetings and priorities conferences to determine future test planning requirements.

- C. Continue inputting test request data into CROSS and perform an evaluation and analysis of CROSS-generated outputs.
- D. Continue ASCATS schedule formulation.
- E. Generate weekly MCC Flight Operations Master Test Schedule and required daily updates.
- F. Complete the MILA USB and VHF data flow chart.
- G. Update the MCC data flow chart.
- H. Continue with the compilation and generation of required statistical reports.
- I. Continue schedule controller management of the Flight Operations Master Test Schedule.
- J. Provide schedule controller support for Mission H-2 and ALSEP I.
- K. Provide CROSS training and system familiarization briefings for all section personnel.

4.5 REQUIREMENTS AND INSTRUMENTATION OPERATIONS

4.5.1 Progress During Quarter

4.5.1.1 Requirements

- A. Completed a finalized listing and status of Mission H-2 requirements levied on MSC by external agencies via the PSRD.
- B. Completed a detailed review of Apollo Saturn V PSRD Revision 18 to insure accurate reflection of MSC-established Mission H-2 operational ground support requirements.
- C. Completed Apollo Saturn V PSRD Revision 19 affecting only those portions requiring support for the lunar communications relay unit (LCRU), the scientific instrumentation module (SIM) and the particles and fields sub-satellite (PFSS). The entire Revision 19 is due at OSRO by 21 April 1970.
- D. Completed the Philco-generated portion of the Skylab PSRD Revision 3 reflecting newly identified recovery requirements, data redundancy reduction (DRR), elimination of ARIA support, and deletion of ALDS and CIF support requirements.
- E. Reviewed *MSFC Operation Support Plan*, Revision 0, dated 16 February 1970. Completed review of *KSC Operations Support Plan* through Revision 8, dated 27 February 1970.
- F. Completed a technical review of GSFC and KSC Mission H-2 support response documents, to ascertain MSC requirements compliance.
- G. Completed the MSC input to the GSFC Mission H-2 Documentation Briefing Report.
- H. Completed an updating of Missions H-2 and H-3 DAP and DAP Annex distribution lists.
- I. Administered the distribution of Mission H-2 and H-3 mission-related documentation to appropriate MSFN stations.

- J. Assisted in the generation of FSR's and requests for LSR's and PLSR's required in support of Mission H-2.
- K. Completed preliminary draft of information package containing pending Apollo instrumentation changes, plus Mission H-3 and subsequent mission experiments data.
- L. Completed a briefing package containing pending Apollo Instrumentation changes plus Mission J-1 and subsequent mission experiments data.

4.5.1.2 Operational Tests Supported

- A. Sixty-four Mission H-2 tests were supported, totaling 594 hours.
- B. Seventy-nine ALSEP 1 tests were supported, totaling 439 hours.

4.5.1.3 Training

- A. All Mission H-2 console operators were certified in accordance with the Console Operator Qualification Program.
- B. Personnel in the Communications Unit received training in the LM and CSM simulators.
- C. The Training Unit coordinated and scheduled the Mission H-2 briefing.
- D. A review class was conducted for the Command Unit on USB and command systems.
- E. ALSEP and tracking classes were conducted for assigned operations personnel.
- F. A new course, "Introduction to Technical Writing," was developed by Training Unit personnel.
- G. A preliminary format for the proposed *Console Operators' Handbook* was developed.

H. Console OJT continued for all newly-assigned personnel.

4.5.1.4 Documentation

- A. The *Flight Support Operations Handbook* (FSOH), Volume 4, Revision A, was printed and distributed.
- B. The FSOH, Volume 2, Change 4, and Volume 2, Revision A, were printed and distributed.
- C. The Mission H-2 Preliminary Instrumentation Support Plan (ISP), Revision A to the ISP, and the final Mission H-2 ISP were printed and distributed.
- D. The terminal countdown (NC-1) for Mission H-2 was completed for inclusion in the NOD supplements.
- E. The *Support Count Handbook* (SCH), Revision A, Change 1 (NC4, PC-1 through PC-4) was printed and distributed.
- F. The SCH, Revision A, Change 2 was printed and distributed.
- G. The Operations Activity Plan was periodically updated and distributed.

4.5.1.5 General Mission Preparation

- A. Participated in Test Management Team (TMT) activities for Mission H-2.
- B. Participated in the NOD Agency review and the Annex C (ALSEP) review.
- C. Participated in FSOH and FCOH reviews.
- D. Participated in various mission team meetings, including a GSFC meeting reviewing MSFN problems experienced during previous missions.
- E. Prepared masking plots for the 85-foot and 30-foot stations.
- F. Completed Mission H-2 operational console check lists in all areas.

4.5.1.6 Travel

- A. O. Allen traveled to Patrick AFB, Florida, to participate in the NOD Agency review.
- B. D. Baerd traveled to the Merrit Island (MIL) MSFN station to participate in the launch vehicle redundancy test.

4.5.2 Problem Areas

No major problems exist.

4.5.3 Plans for Next Quarter

4.5.3.1 Requirements

- A. Continue with the generation of Revision 19 to the Apollo Saturn V PSRD, due at OSRO 21 April 1970.
- B. Continue to review applicable support documents and revisions prepared in response to Missions H-2 and H-3 PSRD-established operational ground support requirements.
- C. Continue to assist in the generation of FSR's and requests for LSR's and PLSR's required in support of Mission H-2.
- D. Continue to administer and coordinate distribution of mission related documentation to MSFN stations.
- E. Revise and update distribution lists established for PHO-TR's and NASA DAP documents to reflect current requirements.
- F. Provide engineering liaison and data service support to the Mission H-2 ASPO Mission Evaluation Team.
- G. Commence preparation of Revision 20 to the Apollo Saturn V PSRD.
- H. Commence preparation of Revision 4 to the Skylab PSRD.

4.5.3.2 Instrumentation Operations

- A. Continue support of Mission H-2 flight control and network simulations.
- B. Support the H-2 terminal countdown and mission.
- C. Continue support of ALSEP-1, and begin support of ALSEP-3.
- D. Provide Mission H-2 post-mission analysis and data reduction and begin documentation review and future mission preparation.

4.6 LLTV Operations

4.6.1 Progress During Quarter

A. Tests Supported

1. Flight Control personnel supported 44 flights of the NASA 951 vehicle and 28 flights of the NASA 952 vehicle during the quarter. Six combined systems and C. G. tests were supported.
2. The second LLTV, NASA 952, was placed on flight status on 27 January, following a successful test program.
3. LLTV flight training was provided to Astronauts Lovell, Young, and Scott during the quarter.

B. Training. Due to resumption of the heavy flight schedule, Flight Director/Controller training and simulation was limited to 23.5 hours of flight control simulations, and 100 hours of mission rules and checklist reviews, including analysis and discussion of hypothetical flight situations.

C. Documentation. At the request of the Government, a complete series of finished engineering drawings was provided to replace the drafts specified in the task description. These drawings were delivered to the Government on 27 February 1970 to complete the *LLTV Systems Handbook*.

D. General Mission Preparation

1. Proficiency drills for Flight Directors and Controllers were conducted on a regular basis as the flight schedule permitted.
2. Certain control van equipment modifications required to provide audio warning tones for critical parameter displays were requested by the Flight Control contractor.

4.6.2 Problem Areas

Due to regularly scheduled weekend LLTV flight operations throughout the quarter, overtime is running far in excess of that discussed

in the scheduling plan presented by the Government at the last negotiation. Overtime should be renegotiated in the light of the Government's policy change.

4.6.3 Plans for Next Quarter

- A. Astronauts J. W. Young and D. R. Scott will continue their flight training. LLTV Systems Ground School for astronauts A. B. Shepard and E. A. Cernan is scheduled for 13 and 14 April.
- B. Improvement of Flight Controller displays will continue.

SECTION 5
 SUBCONTRACT STATUS REPORT

SUBCONTRACTOR	ORDER NUMBER	DESCRIPTION	DATE (NASA) APPROVED
<u>Subcontracts:</u>			
Hazeltine	PHO-1-330 Amend. 3	Spec. Substitution	Open
Fisk Electric	PHO-1-361 Amend. 3	Additional Funding	Open
<u>Blanket Orders:</u>			
Ewing Technical Design	PHO-B-115 Amend. 3	Limitation of Payment Increase	N/A
Five P Processing	PHO-B-119 Amend. 6	Limitation of Payment Increase	N/A